SCIENTIFIC AMERICAN

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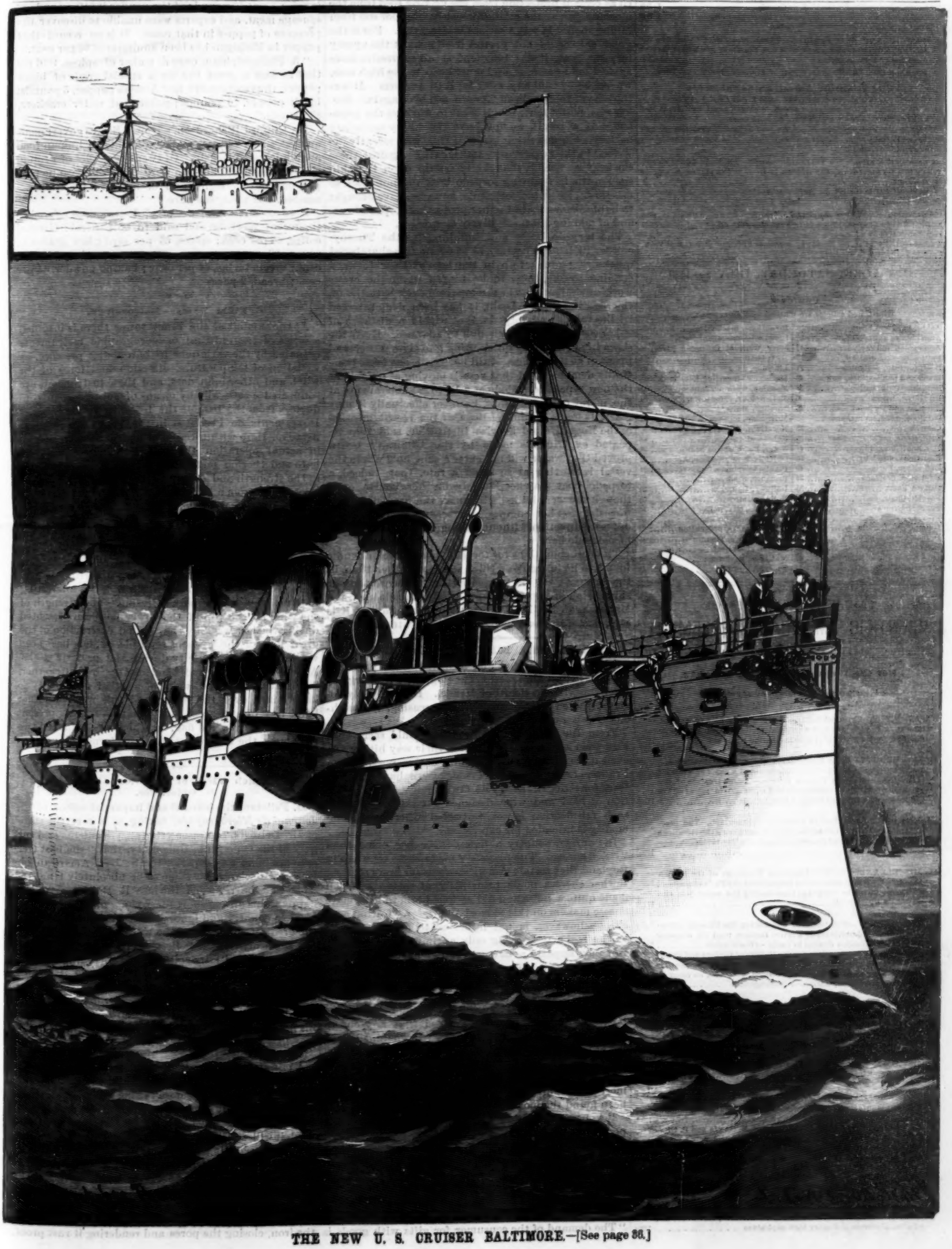

THE NEW U. S. CRUISER BALTIMORE.—[See page 38.]

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NEW YORK, SATURDAY, JULY 20, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 707.

For the Week Ending July 20, 1889.

Price 10 cents. For sale by all newsdealers.

NOVEL TORPEDO BOAT DESIGNING AND MANEUVERING.

When the electric search lights came to be adopted on the war ships, the danger from torpedo boat attack was thought to have been greatly lessened. The search lights, however, could only discover the on-coming torpedo boat; it remained for the gunner to keep it off, and it soon became apparent that, with the means at hand, he was not equal to the task. The heavy guns could not be trained with anything like certainty upon these quick-heeled terrors, nor machine guns be relied upon to beat them off. The shield of the torpedo boat, deflected as it is upon the bow at a sharp angle, afforded as certain protection from the driving shot from the machine gun as the old-fashioned bombproof did from falling shell. It was a serious matter, this. For if the great ship could not protect itself against the pygmy torpedo boat, it was impotent as an aggressive force against land defenses, and must keep to the high seas, where there is not any work for it to perform. It was the case of the whale and sword fish over again. Seeing this, many acute minds went to work on the problem. As a result, we now have the heavy secondary battery of quick-firing guns. [This was recently described in the SCIENTIFIC AMERICAN.] Against these the heaviest shields that can be set up upon the thin shell of the fast-moving torpedo boat will not avail, so it is said. Recent experiments, however, have brought to light means of still further protecting torpedo boats and of making them effectively aggressive.

The torpedo boats now building by the Thornycrofts will have a battery of the new five-chambered quick-firing guns set up in the tops of their forward conning towers, these to be played upon the crews working similar guns in the tops and deck batteries on the resisting ship. Again, it has been demonstrated by the Whitehead torpedo that within a distance of 300 or 400 yards is near enough to advance. Even the shots from the heavy quick-firing guns lose power and precison at that range. Still better, it has been practically demonstrated that vessels moving as quickly as the new type of torpedo boat (22½ to 26 knots) are not at the mercy of a stray shot, however effectually it may reach its mark. Admiral Boys, at the recent meeting of the Royal United Service Institution, said that repeated experiments made by the Admiralty board proved that water will not enter a shot hole where the vessel is moving at so rapid a rate, that, indeed, a torpedo boat may keep safely on her course even though she were hulled. She may run up, deliver her torpedo, stop her engines, reverse, and fly away in the opposite direction without taking in enough water to incommode her.

The best conditions for torpedo boat attack are now found to be in foggy or thick weather rather than in the darkness, the electric search lights aboard the war ships being less potent then; the attack made upon the Monarch, at Spithead, some time since, having, it is said, demonstrated this beyond peradventure.

PENNSYLVANIA BOARD OF HEALTH NOTES.

Adulteration of food and medicine was a principal subject before the recent meeting, at Pittsburg, of the Pennsylvania Board of Health. It was openly declared there that the practice is increasing, the methods growing more reckless.

From the evidence adduced, it would seem that European adulterations finding their way hither are even more dangerous than our native ones. From France, according to the evidence, we have most to fear, for stringent as are its laws against the falsification of food and wine designed for sale in France, such falsification is not restricted where the commodity is intended for export.

In our own country a new danger has come from "sick" cheese. The discovery made some time ago in England that certain American concerns were sending thither cheeses made principally of cotton seed oil made quite a noise and did serious harm to legitimate cheese makers on this side of the water. Cotton seed cheese, however, is not injurious to health, its sale as the real article being only an imposition, a cheat. But now appears a new compound in the semblance of cheese which those chemists examining have declared to be dangerous.

Professor Vaughan, of Ann Arbor, Mich., as quoted in the Pittsburg meeting by Mr. Percy Smith, says: "I think it can be positively stated that any cheese which will instantly and intensely redden blue litmus paper should not be eaten." This is the test of "sick" cheese.

The poor, who buy in small quantities, suffer the most from adulterations, for, it is alleged, in them have been found the most dangerous compounding.

"A beautiful china teapot given away with five pounds of tea."

Beware of that tea!

"A handsome engraving given away with $2 worth of groceries."

Look out for those groceries!

It is in such goods as these that go with prizes that the analyst's search is best rewarded. Mr. Smith said: "The demand of the consumer for gifts with goods is growing rapidly, as the result of a desire of the masses to get something for nothing. It has led to the appearance of handsomely labeled canned goods, such as oysters, peas, corn, etc., which, if they do not contain poison, are absolutely worthless as food. The quality of the food deteriorates in proportion to the value of the gift. If you buy $50 worth of spices and receive a $50 music box with the goods, you have $50 worth of cracker meal and a wheezy music box. Whole spices cannot be ground up and sold for 5 cents or 6 cents per pound less than the unground goods cost. There is not 1 per cent of the genuine article in the pepper of a certain Michigan manufacturer, and the way I know it is this: I put 10 pounds of the pepper in 10 pounds of sausage meat, and experts were unable to discover the presence of pepper in that meat. It is on record that pepper in Michigan has been adulterated 99 per cent.

"A Philadelphian, once a maker of spices, told me that he had a great run on a special grade of black pepper, thus composed: Red African pepper, 5 pounds; black pepper, 10 pounds; pulverized water crackers, 85 pounds."

Mr. Clifford Richardson, a United States government analyst, says: "Spices and condiments for human food are adulterated largely. Of twenty samples of ground cloves examined, only two were pure; of Cayenne pepper, one out of eight; and of mustard, ten were examined, but none was pure."

Here are a few statistics of adulteration, as offered at the recent meeting, and said to be general: Ground coffee, 45 per cent; spices, 66 per cent; low grades of sugar, 20 per cent; teas, 48 per cent; sirup, 50 per cent; cream tartar, 44 per cent; baking powder, 44 per cent; bread, 2 per cent.

Eiffel Tower Meteorology.

At the summit of the Eiffel tower there is installed a series of transmitting meteorographic instruments actuated by the variations in barometric pressure, by variation of temperature, direction and force of the wind, and other influences, and these instruments are connected electrically by means of subterranean conductors from the base of the tower to the Gallerie des Instruments de Precision in the Palais des Arts Liberaux. Here within the same glass case may be seen in actual operation the records being made of the baro and thermo meteorograph and of the variations in the strength and direction of the wind transmitted electrically from a horizontal distance of a quarter of a mile and from a height above the ground of close upon a thousand feet; and no better inducement to the public to make the ascent could be given, says *Engineering*, than is supplied by the readings of the various recorders showing in torrid and airless galleries of the exhibition how very different are the meteorological conditions "upstairs." An interesting illustration of the perpetual freshness and strength of the wind at the top of the tower has been presented during the last week by the gradual destruction of the great flag of the French republic, which has been waving over the gay city during the past six weeks. A few days ago the red band disappeared altogether, leaving the blue and white of another nationality to keep guard over the tower, and this week another band has disappeared, and the tower is at present surmounted by a red flag, to which are attached two streamers, the sole remnants of its former upper and lower edges.

A French View of American Microscope Objectives.

M. Pelletan, the learned and impartial editor of the *Journal de Micrographie*, taking as a text the state- of Dr. Detmers, professor veterinary medicine and surgery of the Ohio State University, that "the best German are in no way superior to the best American objectives," declares the same to be absolutely true, and adds that he regarded the late R. B. Tolles, "so unhappy in his all-too-short life, so long misunderstood in his own country and ignored in Europe," to have been the greatest optician in the world. In the course of the same article, Dr. Pelletan pays a very high compliment to the last volume of proceedings of the American Society of Microscopists, finding it superb, not only in the mechanical execution—printing, paper, and engravings—but in the scientific quality of the papers. He is especially complimentary, and justly so, in his notes on the papers of Dr. Kellicott and Professor Burrill.

A CORRESPONDENT writing to the *Artisan* gives a simple plan of preventing sheet iron stacks from rusting. He says that if before raising the new chimney, each section, as it comes from the shop, be coated with common coal tar, then filled with light shavings and fired, it will resist rust for an indefinite period, rendering future painting unnecessary. In proof of this he cites a chimney which was erected in 1866, treated as above described, and is to-day as bright as it was the day it was raised, without having a particle of paint applied since. The theory by which he accounts for this result is that the coal tar is literally burned into the iron, closing the pores and rendering it rust proof.

Government Jetty Work at the Mouth of the Columbia River, Oregon.

The bar at the mouth of the Columbia River, Oregon, has been a source of dread to mariners frequenting that region. The channels through it are constantly changing in position and in depth. There are sometimes a north, middle, and a south channel. When all these exist at the same time, the difficulty of entering the river from the sea is very great. When there is but one channel, it is generally of sufficient depth to accommodate all ordinary sea-going vessels, and no trouble is experienced in crossing the bar, excepting during stormy weather. Under favorable circumstances the usual depth of water on the bar at low tide is from 24 to 27 feet. The rise and fall of spring tides is 8 feet.

Notwithstanding the difficulties and dangers to be met with at the bar, the commerce of the Columbia River from the earliest times has been remunerative to those engaged in it. Since the commencement of the development of the "Inland Empire" to which this river affords communication, this commerce has increased yearly until it has assumed such proportions as to demand radical measures in the way of improving the channels.

The earliest chart of the mouth of the river is that made by Vancouver in 1792, the next one is the Admiralty chart of Sir Edward Belcher, made in 1839, then comes the chart of 1841, made by the Wilkes exploring expedition. Since that time various charts have been made by coast survey and engineer departments of the government. A comparative examination of these shows that the channels and spits and sand islands of this region are subject to most remarkable changes. Good channels appear to have existed in 1792, 1839, 1841, and 1868.

The Columbia River enters the Pacific Ocean between Cape Disappointment, a rocky headland on the north about 200 feet high, and Point Adams, a low, changeable, sandy point, six miles distant in a southeast direction. Fort Stevens, a semi-permanent work built during the late war to guard the entrance to the mouth of the Columbia, and now in a state of rapid decay, occupies the inner side of this point. From Point Adams a broad, sandy spit called Clatsop Spit runs to the northwest a distance of over four miles. A similar spit puts out from Cape Disappointment one and one-quarter miles to the south-southwest. Over these long spits must pass much of the water that ebbs and flows over the bar. The force of these currents is lost so far as any useful effect that they may have in keeping open the bar channels is concerned.

In 1882 the necessary legislation was obtained from Congress to enable the engineer department of the government to seriously consider the question of permanently improving the channel over the bar, and giving it some definite and fixed position. A board of engineer officers was convened, whose duty it was to give the subject thorough investigation and study and report a plan with estimates for a permanent improvement. The project proposed by this board, and which has been adopted by Congress, contemplates a single permanent channel across the bar, having the depth of 30 feet at mean low tide. This result is to be obtained by concentrating and directing the water passing over Clatsop Spit in such a manner that the resultant currents will add their force to the other natural causes that tend to increase the depth of the channel. A rock jetty resting on brush mattresses is to be built from Point Adams out across this spit in a westerly direction, curving slightly south, for a distance of 4½ miles, more or less, as circumstances may require, to a point about three miles south of Cape Disappointment. The distance to which the jetty will extend to seaward, as well as the height to which it will be raised, will be more or less tentative, dependent upon the results obtained. The estimated cost is $3,710,000.

The construction of the jetty was commenced in 1884. The methods adopted are somewhat different from those usually pursued in the construction of like works projecting into the sea. The large quantity of fresh water emptied into the sea at this point by the Columbia River makes it a locality entirely exempt from *Teredo navalis* and other marine insects, so often destructive to timber work used in sea coast improvements. This work is under the supervision of Major Thos. H. Handbury, of Corps of Engineers, U. S. A.

The plan adopted for placing the material in position was to build a double track tramway on piles, and from this deposit the material in place. The piles are driven by the hydraulic process by means of a specially devised machine working always at the outer end of the tramway. The pile driver is accompanied by a tender car on which is carried a day's supply of piles, stringers, capping, rails, and other material used in the construction of the tramway. Three bents, or 48 feet, per day is the usual rate of advance when no accidents or detentions occur. The piles are driven from 20 to 22 feet into the sand, usually in about 4 minutes. The depth of water varies from 7 to 20 feet. It is usually about 12 feet. The top of the stringers on which the rail is laid is 28 feet above mean low water. The distance between the center lines of the two tracks is 13 feet. The inside brush mattresses are made on poles hung from the stringers and slid down the piles, weighted with sufficient stones or sand bags to sink them. The outside mattresses are made upon cars, dumped into the water, and afterward sunk. Rocks varying from 100 lb. to 8 and 10 tons are then thrown upon these mattresses from dump cars on the tracks above. It is designed that the crest of the jetty shall be about under the north track. The greater portion of the rocks, and especially the larger sized ones, is dumped from the south track. To suit the special conditions of this case, it was found necessary to devise a special car giving a greater angle of dump than can be obtained with those of the usual pattern. This car has another advantage in that it is so constructed that when loaded its center of gravity is above the axes around which its bed rotates, and when unloaded it is below. The result is that as soon as relieved of the weight of the rock, the bed of the car rights itself.

The rock used in the jetty is obtained from quarries located on the banks of the Columbia River, about 110 miles above its mouth. It is conveyed there in barges to the wharf at Fort Stevens, there loaded on the dump cars, and hauled by locomotive out along the tramway and dumped on the jetty.

A large and valuable plant has been accumulated on this work, consisting of locomotives, cars, steamboats, tugs, barges, wharves, machine shops, hoisting engines, and other appliances necessary to extensive operations. From 400 to 600 tons of rock are being handled daily and the jetty tramway extended at the rate of about 40 feet per day. The plant is owned by the government. The rock is delivered by contract on the barges at the quarries. The jetty tramway has already reached a point about 1½ miles from the shore; the rock, however, has not been carried out to the required height for this distance. As the jetty is built out it is found that the spit rises on the south side and keeps nearly abreast with the mattress work. The good effec tsof this work are already becoming apparent. One straight channel is now being formed directly out through the bar to sea, and all others are closing up. It is expected that in a short time the desired depth will be obtained, and if Congress will make the necessary timely appropriations to complete the work, no difficulty will be experienced in maintaining the channel.

A Singular Fire-Place Explosion.

A correspondent sends us particulars of a singular explosion which took place at a private residence in Haverhill, Mass., some weeks since. The family was seated in the parlor, and a fire was burning in the open grate. Suddenly, at about 8 o'clock, an explosion took place in the grate, which made a loud noise, filling the room full of smoke, and breaking a large pane of glass from a front window some feet away. As soon as the family recovered from the shock an investigation was made, which developed the fact that the ornamental tube, which was about an inch in circumference and which arched the fire-place, was broken, and that the explosion was caused by resin, with which the tube was filled, taking fire. It appeared also that the tube had been broken and soldered together, and that a portion of the soldering had come off, leaving a hole through which the resin, having become overheated, found vent. The explosion was one of great power, throwing the resin all over the room, on to the wall paper, ceiling, furniture, and clothing of the persons in the parlor. The glass was broken by the concussion, which also destroyed the window screen. It was a wonder that no one was injured, though all were made momentarily sick by the gas. The noise of the explosion was heard at quite a distance.

[Resin is largely used to fill pipes to prevent flattening while bending. The custom of the trade is to melt the resin and pour it out of the pipes after the bend is finished. In the case in question probably this was neglected, and, the ends of the pipe being sealed by cold resin or plugged, the action of the heat on the central portion generated gas in a confined space, possibly several hundred pounds pressure, or sufficient to burst the pipe.—ED.]

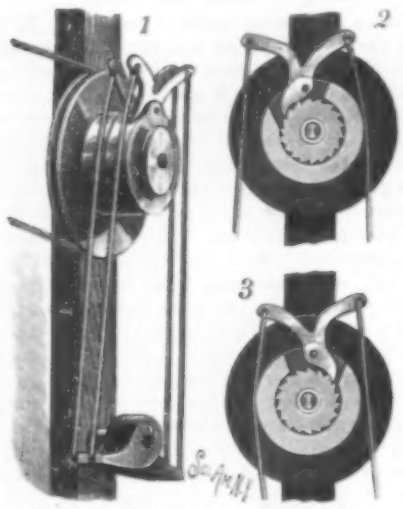
THE British consul at Tientsin in his last report gives some details respecting the new railway in North China, between the Kaiping mines and Tientsin, which was completed last summer, and is now open to traffic throughout. He says it is eighty-five miles long, and the average cost was £4,350 per mile. This includes all rolling stock and engines and a considerable sum spent on stations, wharves, etc. The rails have come from Bolckow & Vaughan, with the exception of 600 tons of light rails from Krupp. Rolling stock is built on the spot from iron purchased chiefly in England. This system saves the heavy freight charged on bulky cargoes, and enables the company to make exactly what suits it best. The passenger cars, steel framed and teak, are 55 feet long and carry more than 100 people. They cost complete about £350. One engine came from the United States, the others are English built on the American system, which has proved itself the best for the rough roads laid with light rails. The American engine cost twenty per cent more than the others, but she beats them in actual performance, the details of working parts being better. Steel fire boxes are found to last longer and give less trouble than copper ones, though the engines only run about 200 miles without being cooled for washing out. The water along the line is very salty.

Aches of Head and Heart.

There are a good many kinds of headache. In these days the nervous headache is a very distinct variety. It is generally in the front of the head, across the forehead, over the eyes. But it may be in other parts—at the top of the head, at one or both sides, at the back, or all over. It is painful, depressing, disabling. A man feels, at the height of the paroxysm, like a hunter who has galloped his legs clean off, and who could not leap a three-foot ditch to save his life. The spur is of no use, neither is the whip. The pain in the head is worse to bear than either, and the patient will rather endure both whip and spur than make any kind of effort which will make the head pain worse. Physic by itself is of no use. There is not a single drug known to medical science which will of itself at once and permanently cure a nervous headache. On the other hand, drugs are not always needed. A complete change of air and circumstances will usually take away the pain in ten or twelve hours. Perfect rest, of a duration proportioned to the severity and long continuance of the symptoms, will make the cure permanent. There are, of course, methods of relieving or diminishing the pain until such time as it may be possible to obtain the complete rest. But the rest is the thing to be secured at all costs. If not, the pain goes from bad to worse, and the risk from less to greater. The final consequence it is impossible to predict, except that a breakdown is sooner or later inevitable, and the breakdown may be for a year or for a lifetime. A nervous headache is a danger signal; if it be frequent, the danger is increased; if it be continuous, a catastrophe is imminent. The driver must put on his brake at all hazards, or he will probably soon have a leap for his life. There are very few sets of circumstances in which it is a man's duty to go on with his work when he is in this condition, at all risks. Even a threatened bankruptcy had better be risked than a threatened life. Besides, a man who is in the unyielding grip of a permanent nervous headache is not really the best judge of his own circumstances. He magnifies and distorts things amazingly. He takes counsel of his fears, and abandons his hopes and courage altogether. Rest, we repeat—immediate and sufficient rest—is the sovereign remedy. A fortnight at once may be better than a year six weeks hence. A weak heart seems to be decidedly more practically inconvenient than a weak head. If a man or a woman be a little feeble about the region of the brain, it is generally of little moment. Some post or other will be provided if the conduct be respectable; and lack of brains is too common to excite any particular attention either in the person concerned or in those about him. But a weak heart insists upon putting itself in evidence at all sorts of convenient and inconvenient times. If its possessor finds himself rather late for his morning train and makes a "spurt" to recover lost time, the exertion is usually followed by such a "bad quarter of an hour" that he resolves in future rather to lose a dozen trains than to risk temporary suffocation or permanent syncope again. The practical evils that are associated with a feeble heart are innumerable, and will readily suggest themselves to those who possess so unsatisfactory a pumping engine. Weak hearts are by no means so common as is often supposed. Many a man who thinks he has got one is merely dyspeptic; many a woman owes her symptoms to tight lacing or insufficient feeding. If the dyspepsia be cured, or the tight lacing be dispensed with, the symptoms of heart weakness will disappear. Even when the heart is genuinely "weak," the weakness is not always due to special disease of that organ. It may be only part of a general weakness of the whole system, which is easily curable. The late Sir Robert Christison, one of the most eminent of British physicians, used to smile at certain persons who were always complaining of weak hearts. "Gentlemen," he would say to his students when lecturing on digitalis, "gentlemen, the best tonic for a weak heart is a good brisk walk." Not a doubt of it. The majority of weak, flabby hearts are weak and flabby because every other muscle in the body is weak and flabby, and this general weakness and flabbiness is due to want of vigorous use. Exercise of the legs and back and arms gives additional and much needed exercise to the heart, and the heart grows strong by vigorous exercise exactly as every other muscular organ does, for the heart is a muscle. If a man has no organic disease of the heart, no enlargement and no functional disorder, plenty of brisk walking, with occasional running, will soon dispel his breathlessness and heart weakness, other things being equal. The muscular inactivity of the modern town man is the parent of more ill-health than any other single cause whatever.—*American Analyst.*

A MECHANICAL MOVEMENT.

A mechanical movement designed to convert a swinging motion into a continuous rotary motion, and at the same time avoid dead centers, is shown in the accompanying illustration, and has been patented by Mr. James H. Baker, of Savannah, Mo. It is preferably mounted on a post carrying a fixed shaft on which turns loosely a wheel connected by a belt with suitable machinery to be driven. The wheel has a hub with

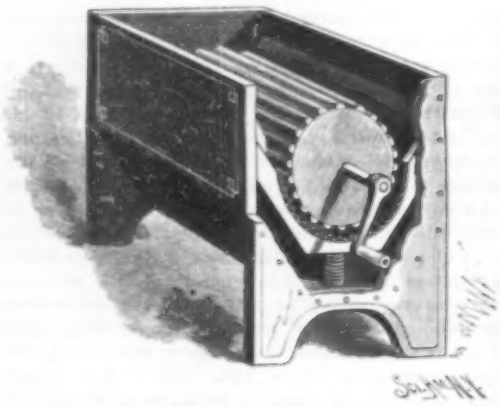


BAKER'S MECHANICAL MOVEMENT.

two sets of ratchet teeth standing in opposite directions, as shown in Figs. 2 and 3, collars fitting loosely on the hub over the ratchet teeth, and pawls fulcrumed on the collars to engage the teeth, while a lever mounted to swing on a stud is connected by belts to arms extending outward from the pawls. The wheel with its hub is held in place on the shaft by a washer, which also serves to hold the collars in place.

AN IMPROVED WASHING MACHINE.

A washing machine which may be conveniently operated with one hand, and which has a continuous bot-



JOHNSEN'S WASHING MACHINE.

tom rubbing surface to be brought automatically in proper frictional contact with the rubbing cylinder, is illustrated herewith, and has been patented by Mr. Hans Johnsen, of Menominee, Mich. In the bottom of the body is placed a series of spaced blocks, whose upper surfaces are concaved in circular form, these blocks being adapted to slide up and down in the body with a limited movement, but being held in normal position by coiled springs, of which there are preferably three, one in the middle and one at each end. The springs may be securely attached to the bottom of the body and to the blocks, or may be so attached that the blocks can be removed as desired. The blocks are connected by a plate of corrugated zinc or other metal, shaped to conform to the circular contour of the upper edge, and extending from one end block to the other. The upper rubbing cylinder has on its outer surface a series of semicircular strips extending from head to head, and when the upper and lower rubbers are in their normal positions, the lower rubber is in close proximity to the upper rubber, the necessary pressure between the rubbers being automatically furnished by the springs.

Improvement in Telephone Exchange Plants.

The recent increase of capital granted to the American Bell Telephone Company was asked for to provide for the construction of a magnificent system of metallic circuits connecting all the large cities of the country.

In order that the full benefit of these trunk lines shall be realized, it is necessary that the various local companies should entirely reconstruct their plants, putting in metallic circuit switchboards and underground conductors, twisted in pairs.

If all of the licensees co-operate with the same ability as that displayed by the Chesapeake and Potomac Telephone Company, the telephone service of the country will soon be on the high road to perfection. This company furnishes a good example of the value of one man power when you have the right man.

Mr. S. M. Bryan, the president and exective officer of this company, has been a close observer of the direction in which telephone improvement is to be attained, and has decided to put his Baltimore exchange on a metallic circuit basis at once.

He has just placed with the Western Electric Company an order for over 40 miles of 100 conductor metallic circuit Patterson underground cable. This is by far the largest order for telephone cable ever given, amounting to over $150,000.

A magnificent new building has been erected, and in this will be placed a Western Electric multiple switchboard of most approved pattern. This switchboard will be adapted for the use of both metallic circuit and grounded lines, and when completed will accommodate 6,000 subscribers.

By next fall every subscriber in Baltimore will be provided with a complete metallic circuit of copper wire. No iron wire will be used, the circuit of each subscriber being made up of hard-drawn copper wire from the cable terminal to the instruments.

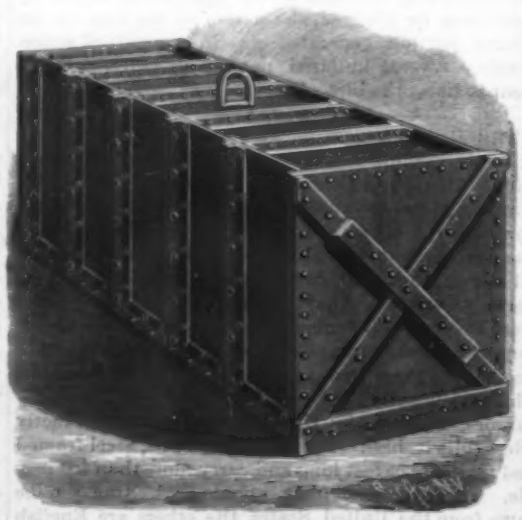
Baltimore will be the first all-metallic circuit exchange in the United States, and we predict that it will be without equal in the world.—*Electrical Review.*

Governmental Statistics.

Some interesting statistics may be gathered, says *Bradstreet's*, from the last statistical abstract of the United States. It appears that the revenue of the government amounted in 1888 to $6.32 per capita of population. The expenditures of the government, not including payment of the national debt, amounted to $4.47 per capita. The national debt per capita amounted to $17.71, and the interest thereon to 65 cents. The duties collected on imports amounted to $3.47 per capita, and the internal revenue amounted to $2.07 per capita. The average ad valorem rates of duty on all imports in 1888 amounted to 30 per cent, and the average ad valorem rates on all dutiable imports amounted to 45·63 per cent. The per capita estimates above given are based upon an estimate of a population of 60,018,000 made by the late actuary of the Treasury Department. This estimate is in all probability too low. An increase of the figure for population would of course require a slight reduction in the per capita estimates. The statistics regarding savings banks over a period of five years show a steady growth in the number of deposits and in the aggregate amount of deposits, with but a slight change in the average amount due each depositor. In 1887–88 the aggregate deposits amounted to $1,364,196,550, the number of depositors amounted to 3,838,291, and the average amount due each depositor was $355.41.

AN IMPROVED ANNEALING BOX.

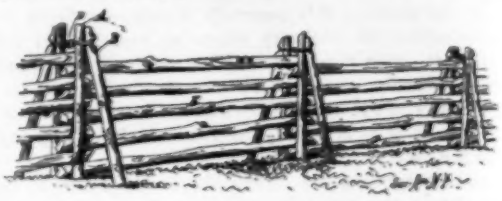
The illustration herewith represents an annealing box designed not to warp, and so constructed that the metal being operated upon within the box shall be protected from oxygen during the process of annealing. It has been patented by Mr. William H. Bailey, of the Republic Iron Works, Pittsburg, Pa. The side plates of the box are braced and supported by T or angle irons, bolted or riveted to place, other angle irons being arranged along the lower edge of the plates, which serve as supports for the bottom plate, while the ends are strengthened by cross braces riveted to place. The cover rests upon angle irons upheld within the box by rivets or bolts, and this cover is braced by angle or T irons which extend upward, so that their upper edges are about level with the upper edges of the side plates, thus providing for the placing of a layer of sand upon the cover plate, to protect the cover, and to a certain extent prevent its warping. A box of this description, with a flat top, will not only hold more iron than one with an arched top, but it is claimed that it will last longer and can be made cheaper.



BAILEY'S ANNEALING BOX.

BARTON'S IMPROVED FENCE.

This invention, which has been patented by Mr. D. R. Barton, of No. 9 Madison Street, Memphis, Tenn., provides for a fence more particularly to take the place of the old Virginia or worm fence, and enable farmers to utilize to the best advantage their rails or rail timber. It consists of upright posts or stakes, braces, horizontal rails, and fastening devices, as will be seen by the accompanying illustration, showing a part of



the complete fence. A designates the upright posts, B the inclined braces, leveled at their upper ends on their inner sides to fit against the stakes, and notched to afford a firm hold for the wire fastening, D; E representing the rails. The small figure represents a pair of posts and their braces after placing a spacing block, C, in position, in the making of the fence, and with the wire binding loop in place, F designating a bar or rod used in twisting this loop. In making the fence, after the first pair of posts is sunk, a narrow plank, the width of the spacing block, is placed between the posts to keep them a proper distance apart, this plank being carried forward to the next set of posts, and so on until the fence has been completed. The braces are then sunk in inclined position, the spacing block inserted, and a galvanized wire fastening drawn around the tops of the stakes and posts, the ends of the wires being twisted together. The tightening rod is then used to twist the wire vertically until the parts are drawn together with sufficient force, when the rod and spacing block are removed for use with the next pair of posts, and the rails are placed in position as shown.

GERSTLE'S HINGED HANDLE FOR PANS, ETC.

The accompanying illustration represents a hinged handle more especially designed for application to culinary vessels. It has been patented by Mr. Jacob Gerstle, of Portland, Oregon. The handle is formed of a plate provided with an ear, an arm being connected with the plate by a hinge joint, and a sliding fastener placed on the arm and adapted to engage the ear. The ear is tapered to cause the fastener to bind upon it as it is forced downward upon the arm, the latter being provided with a stop pin which limits the motion of the sliding fastener. This handle can be conveniently folded over the pan when not in use, and when arranged for service will take the place of an ordinary handle. For further particulars with reference to this invention, address Mr. Sol. Blumauer, in care of Hexter, May & Co., Portland, Oregon.

The Danger to Electric Light Linemen.

"A lineman carries his life in his pocket, and it may slip through a very tiny hole," said an employe of the Brush Electric Light Company to a reporter of the *Star*. "A cool head and a steady nerve, with a smattering of electrical knowledge, are the prerequisites of a first-class lineman. Unless a man be apt to judge and quick to remember, he will be liable to serious blunders in his manipulation of the wires. Where there are dozens of them attached to one pole, it is necessary that he should be able readily to distinguish each from the others, and have no doubt as to whether it be quick or dead. Contact with the earth through means of a conductor should be shunned like death itself. Moisture in the atmosphere or on the wires or the pole greatly accentuates the danger that always prevails. What is ordinarily a non-conductor becomes imbued with conducting properties when it is wet, and this is why linemen dread to mount the poles after or during a heavy storm.

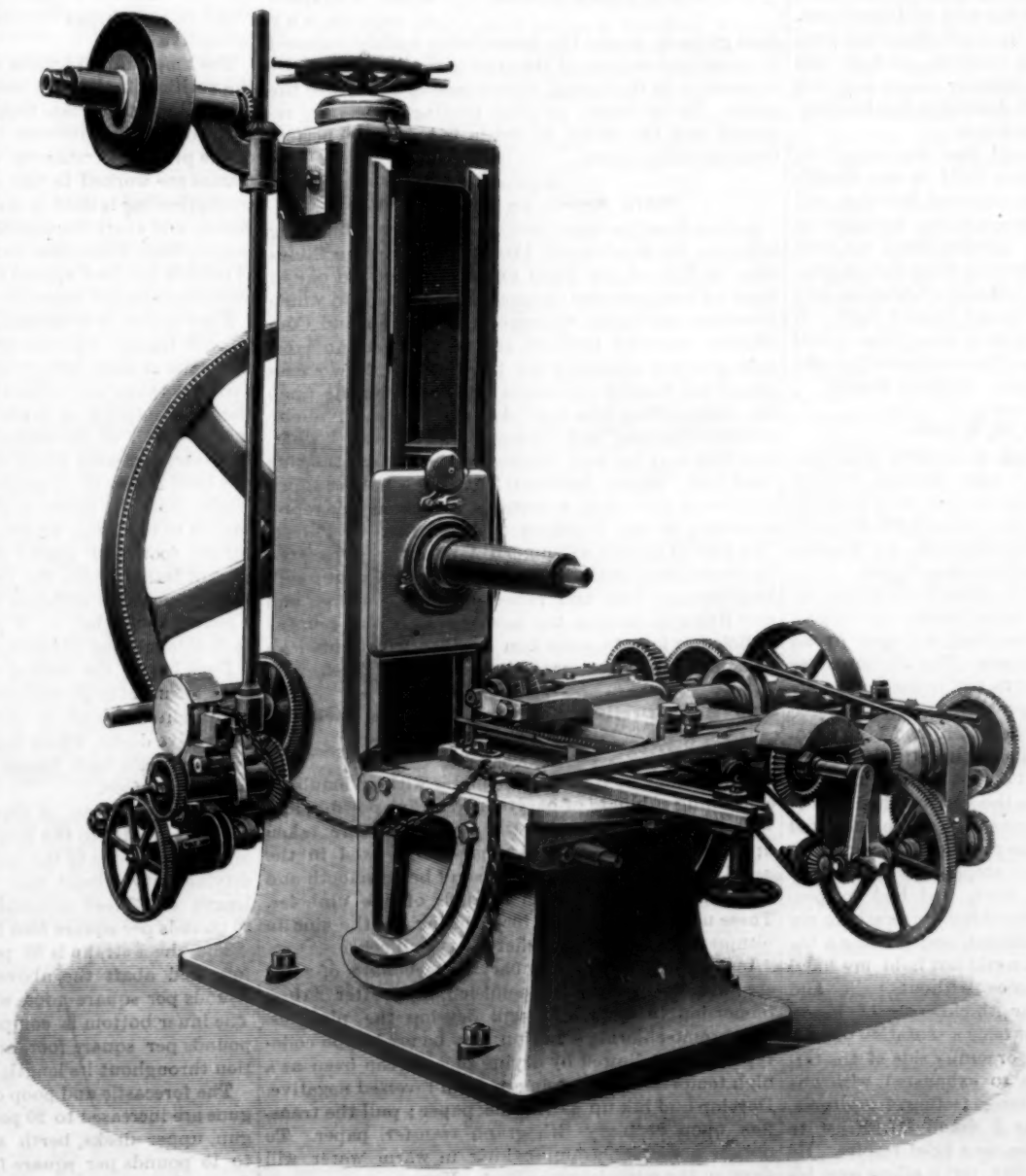
"If a man exercises due diligence and a certain amount of what is termed 'gumption,' he may pursue his business for years without receiving any worse injury than a burn or two. But even the coolest-headed man is liable to blunder occasionally, and there is no other department in life where a blunder of microscopic proportion effects such disastrous results. The contact of a dangling watch charm or a little finger nail with the wrong wire at the wrong time may cost a man his life. So long, however, as he sits astride the cross-piece of a wooden telegraph pole and confines his attention solely to a wire that has no communication with the earth, he is as safe as if he were in his mother's arms."

EBERHARDT'S UNIVERSAL AUTOMATIC GEAR CUTTING MACHINE.

The illustration represents a 72 inch universal automatic gear cutting machine (Eberhardt's patent) constructed by Messrs. John Lang & Sons, of Johnstone, N. B. The gear wheel to be cut is placed on the horizontal spindle, which can be raised and lowered by a screw to set it to the proper height for any required diameter of wheel. On the back end of this spindle is a worm dividing wheel made in sections. It gears with a worm driven by change wheels, which will serve for cutting any number of teeth up to 100, and any number, except prime numbers, up to 200, besides many of higher range. The change wheels for working the worm wheel are driven by the pulley at the top of the machine. This pulley runs constantly. It is joined to its shaft by a friction coupling, and slips, except at the moment when the blank is being rotated. The motion of the pulley is transmitted through the vertical shaft and through gearing to a horizontal spindle, upon which is a disk with notches in its periphery. A bolt normally engages with one of these notches, and holds the disk and the connected train of gearing stationary.

When the cutters have moved back to the end of their travel and are about to advance against the blank again, the chain, seen to the left of the figure, pulls the bolt out of the notch and leaves the disk free to rotate. The bolt is fitted with trip mechanism, which returns it immediately to the edge of the disk, ready to arrest its motion at the next notch. Several disks are provided with different numbers of notches. There are two cutters fixed on one spindle, one for roughing and one for finishing, and the machine is so geared that it can cut iron wheels up to three inch pitch with two such cutters when required. The cutters are mounted on a slide which can be tilted into an inclined attitude by means of the slotted quadrants at the sides. One of these has teeth on its edge gearing into a worm, fitted with a hand wheel, which is seen to the right of the engraving. The cutter frame is moved backward and forward by a screw, which is rotated slowly on the cutting stroke, and quickly on the return stroke. The change from one motion to another is by a clutch operated by stops at each end of the travel. Beneath the cutter is a trough to catch the particles of metal, and in this trough there is a coarse-threaded screw which serves as a conveyer to remove the particles as they fall. This conveyer is driven by a belt, as shown.

The machine will cut spur, bevel, and worm wheels. All the motions are entirely automatic, and one man can attend to several machines. A dial is provided for setting the depth of the cutter, and also a gauge for setting it exactly to the center of the mandrel. There are also graduated indexes for the various adjustments required when cutting bevel and worm wheels.



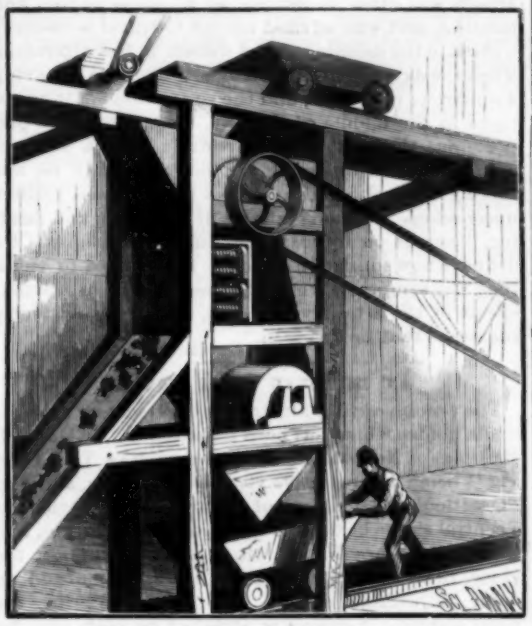
EBERHARDT'S UNIVERSAL AUTOMATIC GEAR CUTTING MACHINE.

Street Railways.

The bill recently signed by the Governor of New York, allowing the street railroad companies to substitute mechanical motive power for horses, is an important one. We hope in time to see it lead to a general use of electric motors on the roads in this city, but we apprehend, with the *Electrical World*, that its first effect will be to encourage cable traction, for the reason that for some years past one or two roads have had their minds fixed on cables and will not be satisfied till they have given them a trial. The difficulty about the destruction of old and new street paving is, however, a serious one, and it may stand in the way of cable work on an extensive scale. The situation, in fact, is not an unfavorable one for electricity, and we expect to see it availed of for the introduction of one or other of the systems of electric traction. Boston has been setting New York a brilliant example in this respect, but it is still open to New York to bring itself abreast of the improvements of the day and hour in urban passenger traffic.

AN IMPROVED MAGNETIC ORE SEPARATOR.

A construction by means of which ore may be effectively separated from the gangue by the aid of a magnet is illustrated herewith, and has been patented by Mr. William R. Thomas, of Catasauqua, Pa. In the frame are upper and lower pulleys, over which extends an endless belt, a magnet over the face of which the belt passes being located beneath the upper pulley. The face of the magnet and the periphery of the upper pulley are about in the same vertical plane, the lower pulley being located at one side, so that the belt travels down over the face of the magnet and over a roller near its lower end, and thence inwardly around the lower pulley, beneath which is located a hopper to receive the concentrated ore as it drops off the belt. Adjacent to the roller at the bottom of the magnetic field is the upper end of a chute for carrying off the gangue. The chute at the top which receives the unconcentrated ore has at one side of its bottom a directing chute, connected with the upper portion of which is an air tube having a chamber with an exhaust fan for carrying away the fine dust which may be in the material worked. The belt is intended to travel about four hundred feet a minute, throwing the ore against the directing chute so as to break the particles apart, when the ore drops down through this chute in a thin sheet opposite the face of the magnet, by which it is attracted to the belt and held there until it is carried out of the magnetic field, when it drops into the hopper.



THOMAS' MAGNETIC ORE SEPARATOR.

Heart Failure.

The *American Analyst* thinks it would be an excellent idea if physicians of the present day would invent some other reason for about all the deaths which occur nowadays than the heart failure. It is difficult for any one conversant with the organs of the human body to understand how any human being can die without heart failure, while the causes of the failure of the heart at death may be very numerous. This might not be of serious moment were it not for the fact that hundreds of people are being nearly frightened to death by the constant use of the cause for sudden deaths, and many people who are sick, and necessarily have some heart symptoms, are kept in constant terror by reading or hearing in other ways of death after death by heart failure. It would be well if physicians who are too indolent or too ignorant to search out the disease lying back of the heart failure to consider how much harm they are doing the community, and if they cannot correct the habit, newspapers and the public should avoid giving currency to this unfounded and dangerous phrase. There are probably no more deaths from heart failure in these times than heretofore, but a new cause for death has been coined, and the nervous and timid are being severely injured by it.

Imitation of Wood Carvings.

Old oak or other carvings in low relief, it is said, may be very effectively and easily imitated, almost in facsimile, by the following process:

Procure some "basil" leather and wet it thoroughly in warm water in which a small quantity of size or glue has been mixed; wipe it as dry as possible with a cloth, then cut a piece sufficiently large to cover the carving and allow a small margin; lay it upon the carving and press with the fingers all over, in order that the leather may take the shape of the carving as much as possible. Next, with a smooth pointed tool made of bone—say the handle of a tooth brush, filed down till it assumes a blunt knife shape—go over the surface carefully, pressing the leather into all the interstices of the design, and smoothing the larger or bolder portions until you have succeeded in bringing out all details. Of course, this process can only be applied to carvings, etc., which are not undercut.

If the superfluous moisture has been removed from the leather in the first instance, it may now be easily taken from the carving without interfering with its shape, but if not, it must be left until partially dry.

When taken off, the leather should be placed in a warm place to dry thoroughly, when it will be found to be quite stiff, and may be coated thickly at the back with a layer of gutta percha, or with the following mixture: Pitch, resin, plaster of Paris, equal parts; melt the pitch and resin together and then stir in the plaster of Paris. If a small quantity of wax candle be added to the mixture, it will be rendered tougher.

The imitation may now be applied to the use for which it was intended, and if treated with dark distemper oak stain and oiled, will look wonderfully like genuine carved oak.

Laura Bridgman.

The recent death of Laura Bridgman has called out a great many reminiscences of this remarkable woman. We do not at this day realize the intense interest which her case at one time aroused; and certainly there has been no reference, so far as we know, to the important data her history furnishes to pedagogy and psychology. The general facts regarding Laura Bridgman are well known. How, at the age of twenty-six months, she lost entirely her sense of sight and hearing, and to a great extent her sense of smell and taste; and how, until she was eight years of age, she received no attempts at education. At this time, it is known that she had quite lost all memory of her life before her sickness; she retained, absolutely, no visual or auditory memories. Dr. Howe's success in teaching her to talk with the hands, to write, read, etc., is also a familiar story.

Most interesting now to medical men is a study of her physiological and psychological condition, made by Professor Stanley Hall, just ten years ago. He found her totally unable to see or appreciate sensations of light from any kind of stimulus. Her deafness was equally complete; but she could appreciate different kinds of vibrations, and even knew her friends by their step. This must have been done, however, by the tactile or muscular sense. Her sense of smell and that of taste were dull.

The tactile sense showed the most acute and remarkable development, and, as recorded by Hall, was as follows:

Tip of tongue	1-50 inch.
Tip of right forefinger, volar surface	1-35 "
Hips	1-30 "
Tip of second finger	1-17 "
Tip of third finger	1-14 "
Tip of fourth finger	1-13 "

The sensitiveness of the face at various parts was also very great, and the measurements in general showed an acuteness of touch two or three times greater than the average.

But the ordinary tests made with the artheriometer gave no adequate idea of her exquisite contact sense, which amounted to a kind of normal hyperæsthesia, so that even specks of dust alighting on the face and hands were appreciated and annoyed her. Curiously enough, her temperature sense was below the average, and the same was true for pressure sensations and electrical irritations. Her tactile memory was so extraordinarily developed that she could at once recognize friends whom she had not seen for a long time by a touch of the hand. Her muscle sense, so far as it could be tested, was not unusually acute. The sense of equilibrium and of direction was very well developed. Curiously enough, she was easily made dizzy and even nauseated by movements of rotation; and it was thought that possibly the semicircular canals were not destroyed by the disease which destroyed her hearing. Yet this seems somewhat improbable.

A very careful inquiry showed that the sexual instinct failed to mature, or show itself in any specific way. She never acquired any notion of the ways and means of its gratification. Although the strongest of human instincts thus failed to develop itself, yet with very little teaching there did develop fresh and original intuitions as to the nature of God and a first cause, and as to her personal responsibility and sense of right. It is encouraging to human progress to know that moral and religious instincts may spontaneously develop and dominate rather than the sexual.—*Medical Record.*

The Great Heat of Siberia.

Siberia is commonly regarded as a region of ice and cold, but according to Mr. George Kennan it is, in summer time, about as hot a country as there is on the face of the globe. In one of his remarkable Siberian narratives, given in the *Century Magazine*, Mr. Kennan thus relates one of his hot weather experiences:

"The farther we went up the Irtes'h the hotter became the weather, and the more barren the steppe, until it was easy to imagine that we were in an Arabian or a north African desert. The thermometer ranged day after day from 90° to 103° in the shade; the atmosphere was suffocating; every leaf and every blade of grass, as far as the eye could reach, had been absolutely burned dead by the fierce sunshine; great whirling columns of sand 100 to 150 feet in height swept slowly and majestically across the sun-scorched plain; and we could trace the progress of a single mounted Kirghis five miles away, by the cloud of dust which his horse's hoofs raised from the steppe. I suffered intensely from the heat and thirst, and had to protect myself from the fierce sunshine by swathing my body in four thicknesses of blanket, and putting a big down pillow over my legs. I could not hold my hand in that sunshine five minutes without pain, and wrapping my body in four thicknesses of heavy woolen blanketing gave me at once a sensation of coolness. Mine was the southern or sunny side of the tarantas, and I finally became so exhausted with the fierce heat, and had such a strange feeling of faintness, nausea, and suffocation, that I asked Mr. Frust to change sides with me, and give me a brief respite. He wrapped himself up in a blanket, put a pillow over his legs, and managed to endure it until evening. Familiar as I supposed myself to be with Siberia, I little thought, when I crossed the frontier, that I should find in it a north African desert, with whirling sand columns and sunshine from which I should be obliged to protect my limbs with blankets. I laughed at a Russian officer in Omsk, who told me that the heat in the valley of the Irtes'h was often so intense as to cause nausea and fainting, and who advised me not to travel between 11 o'clock in the morning and 3 o'clock in the afternoon, when the day was cloudless and hot. The idea of having a sunstroke in Siberia, and the suggestion not to travel there in the middle of the day, seemed to me so preposterous that I could not restrain from a smile of amusement. He assured me, however, that he was talking seriously, and said that he had seen soldiers unconscious for hours after a fit of nausea and fainting, brought on by marching in the sunshine. He did not know sunstroke by name, and seemed to think that the symptoms which he described were peculiar effects of the Irtes'h valley heat, but it was evidently sunstroke that he had seen."

AN IMPROVED GLOBE HOLDER.

The accompanying illustration represents a globe or shade holder which has been patented by Mr. John J. McGloin, of No. 465 Eleventh Avenue, New York City, Fig. 1 being a perspective view, Fig. 3 a plan, and Fig. 2 a sectional view of one of the arms. The device has a central sleeve or tube to fit upon the gas burner, and to this tube are hinged three arms to support the globe, these arms having each a main section and an outer adjustable section, the latter entering the main section. A spring is attached to each arm below the hinge to turn the arm upward, and cause the outer hooked end of the adjustable section to grasp the lower edge of the globe. The adjustable sections of the arms have notches in their under surfaces, which engage with lips in the main sections, to hold the outer sections in proper position. By this construction the holder is adapted to support any sized globe or shade, the latter being readily removed by pressing down one of the arms of the holder against the tension of the spring, thus releasing one side of the globe. No set screws or other holding devices are required, and the globe or shade is held with perfect firmness and security.

McGLOIN'S GLOBE HOLDER.

Sharp Retort on the English.

Joshua Rose has been writing some very interesting letters to the SCIENTIFIC AMERICAN regarding things seen by him at the Paris exposition, and in one of these he took occasion to speak of the extent to which American machinery was copied by English and Continental machine builders, and made a very unfavorable showing, especially for the former. Now comes one of our English exchanges and heaps ridicule upon Mr. Rose, calling him our "American critic," "the intelligent Yankee," and "the great Pajandrum," whatever that may be, and winding up by congratulating itself that "all our American critics are not wrapped up in such utter and monstrous conceit as this representative of the SCIENTIFIC AMERICAN in Paris!" The joke of all this will no doubt be fully appreciated by those aware of the fact that Mr. Rose is a thorough Englishman, born and raised in that country, and now living in London, but having been in this country sufficiently long to make him familiar with American practice in these matters.—*American Machinist.*

To Make Grained Negatives for Zinc Etching without a Screen.

BY W. T. WILKINSON.

This is done by coating the plates with an emulsion containing sulphate of baryta in very fine powder, and well shaken up before coating. Pictures are taken upon these plates, and developed and fixed in the usual way, but the image, instead of being smooth and nice, will be covered with myriads of fine pinholes. These negatives are used for printing on the zinc in bitumen, then etched in relief for type blocks.

Instead of sulphate of baryta, carbonate of soda, etc., may be used in the emulsion, and, after fixing, immersion in weak acid will develop the pinholes. The bromo-chloride emulsion may be used upon collotype plates, followed by drying them in the oven at a high temperature, exposing under a reversed negative. Develop and ink up as for the paper; pull the transfers upon ordinary lithograph transfer paper. To obtain a coarser grain, soaking in warm water will develop the reticulation.—*Photo. News.*

THE NEW U. S. CRUISER BALTIMORE.

BY P. T. DRAKE, U.S.N.

The Baltimore is one of the class of unarmored steel cruisers of 4,400 tons displacement contracted for under an act of Congress passed in 1886, and is classified at the Navy Department as twin screw steel cruiser No. 3.

It was built by Messrs. Cramp & Sons, of Philadelphia, and will soon have an official trial previous to being delivered to the government.

The principal dimensions are:

Length over all	335 feet.
Length between perpendiculars	315 feet.
Breadth, moulded, amidships	48 feet 6 inches.
Mean draught of water	19 feet 6 inches.
Displacement to mean draught	4,400 tons.

The details of the vessel's construction are as follows:

The vertical keel plates are 20 pounds per square foot and extend continuously from stem to stern post, to which they are scarfed. They are 36 inches in depth amidships, and 30 inches before and abaft the double bottom. Their butts are double chain riveted with continuous angle bars of 7 and 8 pounds per foot worked on their top and bottom edges. The flat keel plates are of two thicknesses, the outer 25 pounds, and the inner 20 pounds per square foot. Their butts were planed and fitted in the most careful manner, and connected with treble riveted straps, while the edges of outer thicknesses are double riveted to the garboard strakes.

The stem and stern posts are of cast steel, rabbeted to receive the ends of bottom plating; the lower ends are well scarfed to the keel plates, and specially strengthened for ramming, by panting frames and attachments to protective deck and flat.

The stern post is flanged out to receive the ends of the struts, which support the after ends of the propeller shafts.

Lugs bushed with lignum vitæ were also formed on the post for taking the rudder. Two holes are bored through the post, one for rudder casing and stock, the other for launching tube of torpedo, which will admit of direct fire aft in middle line of the vessel. The rudder frame is of cast steel, with side plates of 15 pounds per square foot, filled in with white pine.

In the wake of the double bottom and below the protective deck the transverse frames are spaced 4 feet from center to center, and are composed of angle bar 5 × 3 inches, of 10 pounds per foot, worked in one length from the vertical keel up to the protective deck. Reverse bars 4 × 4 inches, of 10 pounds per foot, are fitted on each frame between the double bottom and protective deck.

The longitudinal frames are worked on each side of the veritical keel plates throughout the length of the double bottom. Plate frames of 10 pounds per square foot are worked between the longitudinals. In wake of the principal transverse bulkheads solid water-tight frames are worked in the double bottom; additional strengthening is used in the wake of the engine bearers. Before and abaft the double bottom, and below the protective deck, transverse frames are formed of Z bars of 14 pounds per foot spaced 3 feet from center to center, each frame in one length from keel to protective deck.

Floor plates of 10 pounds per square foot are worked on each frame. Special strengthenings are worked in the wake of shaft tube struts and shaft bearers. Great care was taken not to break abruptly the continuity of the longitudinals, or to abruptly decrease the longitudinal strength at the ends of the double bottom. The transverse framing above the protective deck is formed of 6 inch Z bars of 14 pounds per foot worked in one length from the upper to the protective deck, and attached to the latter by bracket plates of 15 pounds per square foot, and spaced the same as corresponding part of frame below the protective deck. The transverse frames are stiffened by a longitudinal formed of a continuous Z bar of 14 pounds per foot worked on each side midway between main and protective decks.

Deck beams are worked on every frame; protective deck beams of angle bulb 25 pounds per foot amidships, with lighter beams at the ends of upper, main, and protective decks, where the ship narrows greatly. Upper and main deck beams amidships are of T bulb, 27 pounds per foot.

The above system of framing for this class of cruisers adds greatly to the structural strength where ramming is to be one of the important features, as well as driving into a head sea. The outside plating for a length of 160 feet amidships is composed of plates of 20 pounds per square foot from keel to sheer strake.

The sheer strake is 30 pounds per square foot. Before and abaft the above limit the plates are 17½ pounds per square foot, with sheer strake 25 pounds. The inner bottom is composed of plates of 12½ to 15 pounds per square foot, and forms a water-tight section throughout its length.

The forecastle and poop decks under the sweep of the guns are increased to 20 pounds per square foot. The gun, upper decks, berth and main decks average 10 to 15 pounds per square foot. Platform plating and floors of magazines are of 10 pounds per square foot.

The protective deck plating is worked throughout generally in two thicknesses, the horizontal portion being 2½ inches thick, while the inclined plating on the two side slopes is 4 inches thick, its connection with the skin plating at the margin line being 48 inches below the L. W. P. at the midship section. All bulkheads are water-tight, and between the main and protective decks the transverse bulkheads stop at and are attached to the longitudinal ones. The coal bunker bulkheads are built throughout the length occupied by the machinery and boilers, and offer additional protection to the latter when fully equipped for sea. Water-tight doors are fitted to all bulkheads, with air locks to the fire and engine rooms when under forced draught. The shaft passages are accessible through water-tight doors, leading to the engine room. The engine and boiler bearers are so constructed as to give free access to all parts of the vessel underneath the double bottom. Wrought iron tubes, with heads and heels welded in solid, form the stanchions which support beams where bulkheads are not worked.

Sounding tubes are fitted to each water-tight compartment. Bilge keels extend over about 140 feet of her length amidships. All magazines and shell rooms are below the water-tight protective deck, and have all modern appliances for electric lighting, ventilation, flooding, and draining. A powerful steam steering gear, of the most approved pattern, is connected with the rudder below the protective deck and easily accessible at all times; it is also capable of being thrown out of or into action at the will of the helmsman from the conning tower, wheel house, or after steering wheel. Telegraphic indicators under the protective deck show the position of the helm at all times. The conning tower is located on the forcastle deck and constructed of plating 120 pounds per square foot. Speaking tubes and electric connections lead from it to all parts of the ship and to battery.

The armament consists of four 8 inch breech-loading rifled guns mounted in barbette, two on the forecastle and two on the poop, each having a train on their respective sides from a line parallel with the keel to 60° abaft and forward of the beam respectively. The remaining battery is composed of six 6 inch breech-loading rifled guns, three in a broadside, mounted on platforms having semicircular galleries projecting from the vessel's sides. The forward and after pair train through an arc of 135° from a line parallel to the keel to 65° abaft and forward of the beam respectively. The middle pair have a train of 65° forward and abaft the beam, or through an arc of 130°. The secondary battery consists of eight 6 pounder rapid-firing guns, mounted four in broadside, two on the bow and two on the stern, having commanding positions, with the most effective range possible. Five torpedo tubes are fitted, two in the bow with direct fire ahead, one on each side in wake of conning tower, and one at the stern with direct fire aft, all located on the protective deck. A perfect and complete plan of ventilation has been adopted upon the exhaust system, which is entirely separate from the blowers placed in the fire and engine rooms when under forced draught, and it has a capacity of 20,000 cubic feet per minute. Each compartment of the double bottom is furnished with its own suction, so that it can be readily filled through the suction, or pumped out by powerful ejectors, which are also connected with the different water-tight compartments below the protective deck.

A steam windlass connects with the capstans which may also be worked by hand. Steam gear for warping ship and hoisting and lowering boats is fitted. Two hollow steel masts with machine gun tops are fitted, as shown in the cut, and also act as ventilators to the lower part of the ship. Two Gatlings in each top. The ward room and cabins on the berth deck are large, commodious, well ventilated, and lighted by the incandescent lamp. They are given a dead finish in sycamore veneering; the doors, having Venetian blinds, slide inside the rooms on noiseless rollers and rubber bumpers. The Admiral's cabin and ward room are also located on this deck. The under side of the deck in ward room, cabins, and state rooms is paneled and neatly finished, while lavatories and water closets of the most approved pottern are complete throughout. The cabins under the poop deck, for the commanding officer, and the steerages below are similarly fitted as above described.

The berthing room for the crew is large and commodious in the forecastle and on the gun deck. Galvanized iron tanks placed over shell rooms and magazines, capable of holding 7,000 gallons, are connected with all living compartments, thus giving an ample supply of fresh water.

Swinging tables and benches for a crew of 300 men are fitted, having all modern conveniences.

The deck house inclosing the galley, which supplies the cooking service, is situated on the gun deck. In order to insure complete sanitary measures, all water closets and lavatories are thoroughly ventilated and connected with steam pumps for cleansing and flushing.

The firemen's wash rooms are fitted with bathing tanks, bowls, waste pipes, drawers, wire lockers, clothes hooks, etc., complete. The surgeons' examining room and dispensary are commodious and perfect establishments within themselves.

The installation of electric lighting on board consists of a plant having two incandescent duplicates arranged to work on the same circuit, capable of producing 125 candle power per mechanical horse power, with average life of 600 hours per lamp. The engines and dynamos rest in oil-tight beds. The engines are of the Armington-Sims type, arranged to drive either dynamo separately or together, and each develops full capacity with a piston pressure of 40 pounds per square inch. They are fitted with condensers and atmospheric exhaust pipes, giving complete control of the engines, which are perfectly noiseless. Each dynamo has a capacity of 3,200 candle power of light, or able to supply 200 16-candle power lamps. They are capable of adjustment, with an independent control over each lamp for 8, 16, and 32 or 10, 16, 32 and 50 candle power, to be used on the same circuit. This supplies ample light to all parts of the vessel, including coal bunkers, magazines, shell and ammunition rooms, running lights, upper deck and aloft.

The propelling power of the vessel consists of two horizontal direct-acting triple-expansion screw engines and boilers capable of developing 10,750 I. H. P. when making about 110 revolutions of the screws per minute, or a speed of 20 knots. The two high pressure cylinders are each 42 inches diameter, intermediates 60 inches, and the two low pressures 94 inches, having a piston stroke of 42 inches. The main steam valves are double-parted slides working on hard cast iron seats.

The Stephenson type of valve motion is used, with single bar links, with arrangements for linking up the high pressure gear independently of the others.

Piston and connecting rods and shafting are of forged steel. Single piston rods with crosshead working in slipper guides connect with each piston.

Composition condensers receive the exhaust steam, which passes through the brass tubes. The total cooling surface is 12,500 square feet. One air pump, worked of the low pressure piston, is fitted to each set of engines, and both air pumps deliver into a feed tank in the forward engine room. A centrifugal circulating pump is connected with each condenser, and independent bilge and auxiliary fire pump, with additional pump for fire purposes only, are located in each engine room.

Crank shafts are 15 inches in diameter in journals, with axial hole 7 inches diameter. The three cranks for each engine are set at equal angles, each with a throw of 21 inches. The line and thrust shafts are 14 inches in diameter, with 8 inch axial hole.

Propeller shafts are 15 inches in diameter, with axial hole of 9 inches. The crank, line, and thrust shafts are connected by flange couplings. The after end of thrust shafts each have a coupling flange. The forward end of each propeller shaft is fitted with a wrought iron sleeve, keyed on. This sleeve is secured to the shaft by a wrought iron washer, which in turn is fastened to the shaft by a steel stud and nut, so as to take the backing thrust. Pillow blocks are of cast iron, bolted to seatings, and each bearing is lined with anti-friction metal. The thrust bearing pedestals are made in two parts, with white metal linings. A composition lining with lignum vitæ bearing is fitted in each stern bracket bearing, which takes the shaft casing.

The screw propellers are made of manganese bronze, having three blades each, 14 feet 6 inches in diameter, set to a mean pitch of 20 feet, with a variable pitch between 18 feet 6 inches and 21 feet 6 inches. The starboard propeller is right-handed, port one left-handed. The four main boilers each have a shell of $1\frac{1}{16}$ inches thick, are double ended, horizontal return fire, tube type, 14 feet 8 inches in diameter, and 17 feet 8 inches long over heads, and will carry a working pressure of 135 pounds per square inch. They are situated in pairs and placed fore and aft in two water-tight compartments with four athwartship fire rooms. The total heating surface is 16,900 square feet. The two auxiliary boilers each have about 250 square feet of heating surface.

There are four corrugated furnaces at each end of each boiler, and four combustion chambers in each boiler, each of the latter being common to two furnaces, which are separated by a fire-brick wall. The fire rooms are air-tight, with two blowers in each, or eight in all. Each blower is capable of continuously furnishing to the fires 20,000 cubic feet of air per minute, under a pressure of four inches of water. The blowers are driven direct by a three-cylinder Brotherhood engine of latest pattern, which runs at full speed with steam of 100 pounds pressure. The total capacity of coal bunkers is 900 tons, the normal capacity 400 tons. This admits of the following fuel endurance: At 17 knots, 8·5 days, 3,468 miles; at 15 knots, 12·6 days, 4,536 miles; at 10 knots, 49·5 days, 11,880 miles.

The engine boilers and pipes are entirely below the protective deck. There are two smoke-pipes, which begin just above the protective deck and follow the shape of uptakes to the upper deck, where in the next six feet they merge into an oval cross section, and keep this form to the top, 60 feet above the grate bars. The distillers have a combined capacity of 5,000 gallons and take their steam from the auxiliary boilers.

Two search lights are mounted, one on the conning tower, the other on the after end of poop deck.

The two 8 inch breech-loading rifled guns on the forecastle are 27·5 feet above the low water point, the two on the poop are 26·5 feet, while the 6 inch breech-loading rifled guns in broadside are 18 feet. As will be seen, this class of cruisers will be capable of fighting their battery in almost any conditions of weather at sea, and bid fair to become the most popular type of cruisers afloat for all-around work.

The first trial trip of the new vessel, being a private trial by the firm preliminary to its official test by the government, took place last week, from Wednesday to Friday. Captain Joe Steel, a veteran merchant skipper, was in command, and among those on board were Mr. William Cramp, Mr. A. C. Buell, a naval expert representing Mr. Charles Cramp; Captain W. S. Schley, U.S.N., who is to command the Baltimore; Lieutenant Seaton Schroeder, commander of the Vesuvius; Lieutenant W. F. Fullam, also of the Vesuvius; and Chief Engineer Abel, who is to have charge of the Baltimore's engines. The trip was in every respect highly satisfactory, Captain Schley and the other naval officers aboard expressing themselves as delighted with the vessel.

During the trip the Baltimore's machinery was carefully tested, and it is said that not a flaw could be detected with the engines working either separately or in unison. At no time during the trip were the throttles opened to their full extent. The run to Brandywine Light, a distance of about 78 knots, was made in 5 hours and 36 minutes. The engines were run under natural draught and the vessel was only jogging along. When the cruiser started on the trip she drew 15 feet 2 inches forward and 19 feet 8 inches aft; but by the time Brandywine Light was reached, enough coal had been burned to raise her 6 inches forward.

At 11 o'clock Thursday morning the vessel steamed outside of the whistling buoy. No attempt was made at first either to test the power or speed of the vessel. The object of the trip was primarily to test the power of making steam, the steering apparatus, and to see that the machinery was properly adjusted and everything in good working order. The vessel was "circled" to test her turning powers and the workings of the tiller. The engines were run separately and together; each screw was worked by itself and the two in unison. Every kind of maneuver was tried, and in each case it was found that all parts worked in perfect harmony. In steering she did as well as a pilot boat.

On Friday morning a partial trial for speed was made. Running at the rate of 17 knots an hour, it was found that she could complete the circle in 8 minutes and 45 seconds. The artificial draughts were used for this trial, but not to their full power. Several hours were spent in maneuvers similar to those of the preceding day, but one or two short runs were made at full speed. No efforts were made to put her to the four hour test nor to develop the full horse power. A five knot run was made under a pressure of 8,780 horse power at the rate of 19 knots an hour. At the conclusion of the trial William Cramp expressed himself satisfied and ordered the vessel to return. The run up the bay and river was made without pushing the engines. The run from buoy No. 14, to Ship John light, the old Vesuvius course, a distance of 4·57 miles, was made at the rate of seventeen knots under natural draught. There were about seventy firemen and engineers and thirty deck hands. The entire number on the vessel was between 140 and 150. In speaking of the horse power obtained on the trip, the members of the firm expressed themselves as thoroughly satisfied. From results obtained on the trip, it is estimated that the power can be run up to 10,000. It is expected that the official trial trip will take place at an early day.

Discovery of a New Brooks Comet.

To the Editor of the Scientific American:

While sweeping the southeastern heavens yesterday morning I discovered a new comet in the constellation Cetus or "The Whale." Its position is right ascension 23 hours 45 minutes, declination south 9 degrees 10 minutes. I verified the discovery by a second observation this morning, and find its motion to be very slow in a northeasterly direction. The comet is faintish, telescopic, and has a short spreading tail. Several observations will be required to determine its future appearance, but the indications are at present very interesting.

WILLIAM R. BROOKS

Smith Observatory, Geneva, N. Y., July 8, 1889.

Little Red Ants.

I have found by experience, says the editor of one of our exchanges, that little red ants cannot travel over wool or rag carpet. I covered my floor with coarse baize, set my sofa on that, and have not been troubled since. Cover a shelf in your closet or pantry with flannel, set whatever you wish to keep from the ants on it, and they will at once disappear. I have tried it.

MARIA MITCHELL.

The names of women who have gained fame in art, in literature, and in advancing woman's work are numerous and well known. Science has its followers among the gentler sex, but among them the name of Maria Mitchell stands out clear and conspicuous, like an evening star in the heavens she loved so well to study. In astronomy her name could be mentioned with that of Caroline Herschel, and perhaps it is not too much to say that during her lifetime she was the most distinguished scientist of her sex in this country.

She was born on the island of Nantucket, on August 18, 1818, where her father for many years was cashier of the Pacific Bank. He was a member of the Society of Friends, and was prepared for Harvard College when the war of 1812 broke out. This interfered with his studies, and he became a teacher. Meanwhile he developed a fondness for astronomy, and for a long time devoted his leisure to that science with a rude telescope, built for him by a clockmaker. In later years he was able to provide himself with a well equipped observatory, and continued his researches until his death. During many years he made systematic determinations for the work conducted under the auspices of the United States coast survey, and his son, Henry Mitchell, is to-day an assistant in that body.

Maria was one of the oldest children, and, as has been shown, inherited her fondness for science from her father. At first he was her only teacher, and as a child she made such rapid progress in her studies that she was soon able to assist her father in his investigations. Later she studied under Charles Pierce, and became his assistant in the school at Nantucket. While still a young girl her mother died, and as she was one of the older members of the family, much of the care of the home fell to her charge.

At the age of eighteen she was appointed librarian of the Nantucket Athenæum, which place she held for twenty years, and it was her proud boast that she had regularly earned a salary from the time that she was seventeen years old. While filling this post, she continued her interest in astronomy, and all of her spare time was devoted to the study of the stars. She soon surpassed her father in the zeal and earnestness with which she made her researches. Besides many careful observations, she made a specialty of examining nebulæ and systematically searched for comets. She discovered several small nebulæ, and finally, on October 1, 1847, discovered a comet, now known as Miss Mitchell's. At first she could hardly believe that she had actually discovered a comet, and requested her father to send an inquiry to Cambridge. A few days later Father De Vico saw the same comet in Rome, and it was subsequently seen by astronomers in Kent and Hamburg.

Some years previous, Frederick VI., King of Denmark, offered a gold medal as a prize to any one discovering a telescopic comet. This medal was then given to Miss Mitchell, and also she was the recipient of a copper medal struck in her honor by the republic of San Marino, in Italy.

When the publication of the American Nautical Almanac was begun, she was employed in that work, and continued so engaged until after her appointment to Vassar College.

In 1858, she went to Europe, for the purpose of visiting the leading observatories of Great Britain and the Continent. While in England she was entertained by Sir John Herschel and Sir George B. Airy, the astronomers royal. Leverrier received her in Paris, and Humboldt in Berlin, where she also met Encke. In Rome she met Miss Bremer and became intimate with the family of Nathaniel Hawthorne, with whom she traveled from Paris to Italy.

During her absence abroad a fund of money was raised by the women of America, under the leadership of Miss Elizabeth Peabody, and on her return she was presented with a telescope larger than that owned by her father, and which was set up at Nantucket. Later, when her family removed to Lynn, Mass., the telescope was taken there.

In 1865, she was invited to fill the chair of astronomy at Vassar College, with charge of the observatory. This appointment she accepted, and removed to Poughkeepsie, where she continued in the active administration of her duties until January, 1888, when she tendered her resignation. This the trustees were unwilling to accept, and passed a resolution giving her an indefinite leave of absence, and directed the payment of her entire salary until the board should take further action.

At that time one of her friends wrote: "Maria Mitchell is going from Vassar, yet leaves to the college more than she takes away. Her twenty-five years of influence have left indelible imprint upon the institution which she has helped to build up. She has not been conspicuous for administrative ability, and entirely lacks policy to successful diplomacy; but her sound common sense, her fearless frankness, her courage born of strong conviction, have always made her a power to be respected and feared."

Of her work at Vassar, one of her fellow members of the faculty has said: "When she entered the college council, it was like an ocean breeze sweeping through a superheated room. Her brief opinions, expressed in terse, strong English, swept aside the sophistries of expediency and vitalized the whole moral atmosphere. It is not known that she ever originated or directed to maturity any important policy of college affairs. Her genius was not adapted to the slow elaboration of detail, but the work of construction which was wrought by her associates bears throughout the whole fabric the mark of her sterling honesty. Indeed, she has incorporated so much of herself in the college she served, so much of her lofty character, her earnestness, her wide knowledge and sound learning, that she remains to it a vital force, even now that her personal presence is withdrawn."

On leaving Vassar she retired to her family in Lynn. A reception in her honor was made a feature of the alumni meeting of Vassar Association in New York City, but she was unable to be present, and wrote: "I have noticed that the attempt to grow young is, at seventy, not often a success. It goes to my heart to say that I cannot come to the reception in New York, but I am tired, and after more than half a century am trying to rest."

The rest she sought for was not long in coming. Scarcely a year had passed, when, on June 28, 1889, she died from disease of the brain, at her home in Lynn.

Miss Mitchell was the recipient of many honors. The degree of LL.D. was given her in 1853 by Hanover College and in 1887 by Columbia, also she had received the degree of Ph.D. She was the first woman to be elected to the American Academy of Arts and Sciences, and in 1850 joined the American Association for the Advancement of Science, of which she was made a fellow in 1874. She was prominent in the movement tending to elevate woman's work, and was president of the American Association for the Advancement of Woman at the Syracuse meeting in 1875 and at the Philadelphia meeting in 1876. In late years her special studies were devoted to sun spots and the satellites of Jupiter. Her published writings were restricted to scientific papers, with the exception of a few poems contributed to a volume called "Sea Weeds from the Shores of Nantucket" (1853). M. B.

MARIA MITCHELL.

IN using fire hose pipe there is a loss of ten to twenty-five pounds of pressure to every hundred feet of hose.

Ammonia as an Antiseptic.

Some years ago Dr. B. W. Richardson, in a communication to the Medical Society, called attention to the antiputrescent properties of ammonia, and showed that blood, milk, and other alterable liquids could be preserved for a long time by adding to them certain quantities of solution of ammonia, and solid substances, such as flesh, by keeing them in closed vessels filled with ammonia gas. Some doubts that would appear to have been raised as to the results reported, on the ground that ammonia was itself a product of decomposition, induced Dr. Gottbrecht, of the University of Greisswald, to repeat the experiments, with the result of practically confirming all Dr. Richardson's statements (*Arch. exp. Path. u. Pharm.*, April, p. 385). After some preliminary experiments, in which animal matter placed in 5 per cent ammonia solution was found free from putrescence after nearly two years, ammonium carbonate was used in the place of the free alkali for the sake of convenience. The first experiment, made with the washed intestines of freshly killed pigs, showed the power of ammonium carbonate to retard putrefaction to be directly dependent upon the concentration of the solution, a 1 per cent solution retarding it until the third day, and a 10 per cent solution until about the sixtieth day. When added to gelatine in which putrefaction had already been set up by inoculation, it was found that a 5 per cent solution so modified the conditions that the putrescence ceased, and a 2½ per cent solution inhibited the development of bacteria, so that the liquefaction of the gelatine was practically stopped. Other experiments showed that in an atmosphere impregnated with ammonium carbonate meat could be kept for six months, and at the end of that time remain nearly unaltered.

Dr. Gottbrecht also discusses the conditions under which products of putrefaction may act prejudicially to the originators of the putrefaction. This he believes to be due to a toxic action dependent on the degree of concentration. He points out that cadaverine, a product of decomposition of a cadaver, in certain degrees of concentration acts as a direct poison upon the abscess coccus, and he concludes that, similarly, all products of tissue change in living organisms can become noxions to their originators as soon as their quantity exceeds a certain limit.

Catarrh.

After all that has been said, it must be admitted that changes in the climate, filth, sewer gas, malaria, and what not have much to do with the production of catarrh. Even Fifth Avenue is so filthy half the time as to make us feel disgusted with it. Catarrh in many cases is nothing but a filth disease, and Dr. Mackenzie, of London, says that that is the chief cause of catarrh in the United States. He says there is no such thing as scavenging in this country. This is quite true of some places, but there are towns where catarrh prevails which are as well scavenged as any town in England. But it is not New York City. There are cases of catarrh in this city which are undoubtedly kept up by filth, by irritating particles floating in the atmosphere, carried hither and thither by the winds, such as horse dung and fermenting, putrefying substances. Do not consider, then, that any specialty by itself will control the situation. The treatment of the nose may be well enough where it is indicated, but where filth is the cause of catarrh, something more must be done.—*Dr. Beverley Robinson.*

Charles Fasoldt, Sr.

We learn from Mr. E. H. Griffith, of Fairport, N. Y., that Charles Fasoldt, Sr., of Albany, of whose marvelous micrometric rulings we have so frequently spoken, died at his home after a short illness, last May. We have not learned any particulars, but regard the death of Mr. Fasoldt as the most serious loss sustained by American optical science since the deaths of Tolles and and Spencer. He was a mechanic of marvelous ingenuity, of wonderful exactness and skill, and absolutely untiring in his zeal. His latest work in the matter of illumination as a factor in the resolution of finely ruled bands was published in the *National Druggist* a short time ago. It will be remembered that two impartial observers, reputable pharmacists of Albany (Fred. Neudorff and H. G. Grose), testified to having read his rulings illuminated by his vertical illuminator up to 230,000 lines to the inch. The machine by which these and higher rulings (up to 1,000,000 lines to the inch) were made is the invention of Mr. Fasoldt, and is entirely unlike any hitherto devised. He was a chronometer maker by profession, and took up optical science late in life. He was well advanced in age—in the seventies when he died.

A NEST-BUILDING FROG.

NICOLAS PIKE.

In one of the groups of the Mascareigne Islands, lying northeast of Madagascar, is the Isle de France, now called Mauritius. From its peculiar fauna and flora it has been from early times a favorite hunting ground of naturalists, and it possessed one advantage over most tropical and subtropical lands. Its dense forests and ravines and high mountains were free from venomous reptiles, save a few small scorpions. The only ophidian was a small snake, designated by Dr. Gunther the "blind worm, or *Typhlops flavo-terminatus* (Peters), and this is very rare. Strange to say, on Round Island, only a few miles from Mauritius, there is a breed of serpents of the family *Boidæ*, the *Cesarea Dussumieri*, only known elsewhere in the Loyalty Islands, in the South Sea. Not a frog or toad formerly existed here, but in 1812 a small species of frog was introduced by M. Geneve from Madagascar, and is, I am informed, the *Rana fasciata*.

It has spread all over the island, but varies in size and color in different localities. Most have a bright green stripe on the back, with dark rows of squarish marks divided by white lines, pale underneath, and a glint of crimson near the eyes.

During the frequent long droughts, when the marshy lands are dried up, and two-thirds of the streams show only a few deep holes of water, the frog selects some shady nook where he can pass what is to him a very trying season. A favorite spot is where any long grass has survived, of which I had plenty in my garden. While hunting for land mollusks, I have frequently come upon these frog retreats. When frightened, they make one jump forward and throw out the limpid stream of water which has been carefully stored up in case of need, as in very dry weather. This liquid is distributed over the body in order to keep the pores of the skin open, as at times pulmonary respiration is not sufficient, and the action of the air on the skin is required to sustain life. When starting these frogs from their covert, I have often been surprised at not seeing them jump twice, and after a careful search never could find them again, although I beat the grass with my stick and opened it *in all directions* with my hands.

One day I was joined by an Indian boy, who told me he could catch all I wanted, and very soon he brought me several. My curiosity was aroused, and after a careful examination of their haunts and habits, I was much interested at the display of cunning in these little creatures.

They construct regular passages under the grass, and when first disturbed throw off the water to move rapidly. As I said before, they only jump once, and that from you, and alight in one of their paths unseen by you. Having seen a frog jump in front of you, naturally you would look for him where he seemed to have alighted, but he drops quickly into a path which perhaps leads directly to you. Thus he doubles on you, and to dislodge him is no easy matter, unless you know his habits and are well up in his cunning dodges. In their paths they move as stealthily as a mouse, not disturbing a blade of grass. As soon as I made the discovery, I could catch them with certainty every time, and once captured twenty in a patch of grass not over 15 feet square. They seem to be gregarious. These paths are constructed as regularly as those of a mole, by the little creatures pressing down the short grass near the earth and drawing together overhead longer blades, but not touching the upper surface, thus rendering them invisible. The nests or lairs are about 8 or 10 inches in diameter by 4 in height, and made ingeniously by weaving the lower layers of grass together.

In 1871 or 1872 I communicated the facts of this discovery to the "Royal Society of Arts and Sciences," in Mauritius, and the only one who seemed to know anything about the habits of this frog was the late celebrated naturalist, M. Louis Bouton.

A NEST-BUILDING FROG

Electricity or Steam for City Railroads—Which?

The substitution of some other power for horses for the propulsion of street cars is receiving the attention of most of the horse railroad companies in nearly all our large cities. The managers are becoming convinced that it is time to make a change, and the cable system and electricity in some form seem to be the powers which are receiving their consideration, and to some extent adoption.

Referring to the subject, the New York *Sun* sums up the matter as follows:

The use of animals for the propulsion of street cars notoriously involves the greatest possible expense in producing a given amount of work. It takes considerable money to buy them in the first place, they are liable to numerous diseases and to sudden death, the feeding and care of them requires the services of large numbers of men, and, altogether, they are very troublesome and unsatisfactory. Machinery, on the other hand, whether for cable traction or for electricity, while it may be more costly at the outset, is less expensive to maintain, and it never gets sick nor dies. Coal is cheaper than hay and oats or any other kind of provender, steam engines and boilers do not need a small army of stablemen and grooms to wait upon them, and the repairs and renewals of iron work bear no proportion to those which must be made to keep bones and muscles in good order.

IMPROVED BAR CHANNELING STONE DRILL.

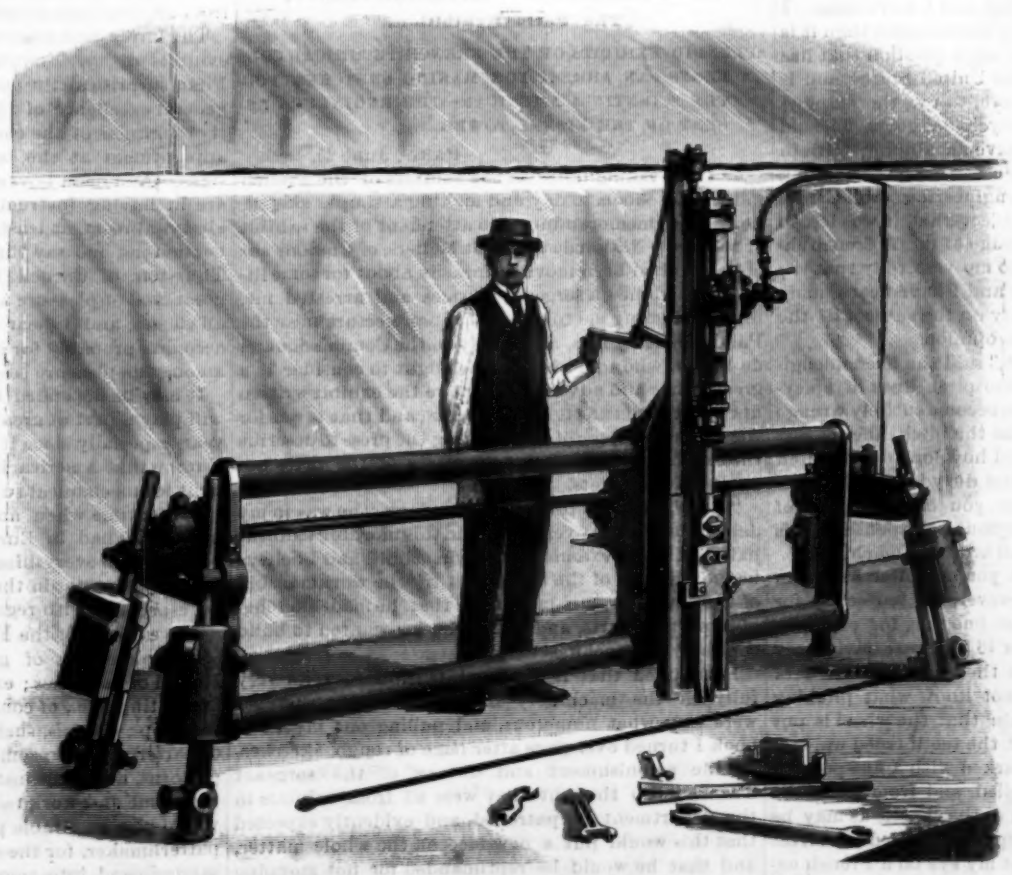
We illustrate in this issue a new quarrying machine lately introduced by the Ingersoll-Sergeant Rock Drill Company, of New York. The machine is known as a "bar channeler." It is the design of Mr. William L. Saunders, C.E., secretary and engineer, Ingersoll-Sergeant Rock Drill Company of New York, who has been the first to adapt successfully the principles embodied in the percussion drill to the varied requirements of stone quarrying.

The view shows the bar channeler ready for use either as a rock drill or as a channeler. After the holes have been drilled, one for each end of the guide bar, a crosshead and clamp carrying chisels are inserted and a channel cut between the two holes. The change from the drill point to the channeling chisels occupies but a moment's time. The principal advantage of the terminal holes is that the cuts do not run off at the end. After the channel has been cut to the depth required, the bar channeler is moved its length by being pinched along the quarry floor with crowbars, the legs of the machine being provided with shoes and projecting lugs for the purpose. It will readily be seen that the next cut covering the length of the bar requires only one hole, as the end of the previous cut takes the place of a hole, and the deep cut forms a receptacle for the cuttings, requiring less labor in spooning out. The bar channeler is capable of angular adjustment in every direction, horizontal cuts being made with the same facility as vertical cuts.

The machine is now in use in marble, sandstone, and limestone. It has a record of 1,400 lineal feet of channel per month, and has made channels to a depth of ten feet.

It is claimed that the bar channeler will run at less expense in fuel, labor, and repairs than any other channeler, only one man and a helper being required to run it.

A quarry was recently opened by Messrs. Davidson & Sons at Gouverneur, N. Y., in what is known as "Gouverneur granite." All the channeling was done by the bar channeler, and the drilling with an "Ingersoll" gadder. Six weeks after the opening of the quarry, the machine produced twenty-two car loads of marketable stone. This is quite a notable record.



THE INGERSOLL BAR CHANNELING STONE DRILL.

Wind Pressure.

At the last meeting of the Royal Meteorological Society, Mr. W. H. Dines gave an account of some experiments made with the object of investigating the connection between the pressure and velocity of the wind. The pressure plates were placed at the end of the long arm of a whirling machine rotated by steam power. The results of experiments with twenty-five different kinds of pressure plates were given by the author. It appears from these tests that the pressure upon a plane area of fairly compact form is about 1⅛ lb. per square foot for a velocity of 21 miles per hour; or, in other words, a wind traveling at the rate of a little more than 17 miles per hour will exert a pressure on a plane surface at right angles to its direction of 1 lb. per square foot. The pressure upon the same area is increased in this arrangement by increasing the perimeter. The pressure upon a ¼ foot plate is proportionately less than that upon a plate of either half or double its size, which rather tends to make one doubtful of the value of the method employed. The pressure upon any surface is but slightly altered by a cone or rim projecting at the back, a cone seeming to cause a slight increase, but a rim having apparently no effect. After this statement, the suitability of experiments with whirling machines for elucidating the problems of natural wind pressure seems to be left an open question.

IT appears as though the idea of executing criminals by electricity, originated and embodied in a law by New York State, was going to extend everywhere. The State of Massachusetts has talked it over and amended its law on the death penalty so as to make it include electricity as a method of execution; other States are moving in the same direction. And now a motion has been brought before the Municipal Council of Paris, France, for the adoption of execution by electricity. Still New York hesitates to carry out its own law.

The Paris Exhibition.

PARIS, June 25, 1889.

A very excellent non-conductor for engine cylinders, etc., is used here, consisting of small pieces of cork, apparently cork refuse granulated. It is moulded into cakes about one inch thick, four inches wide, and six inches long, and cemented loosely together with a cement that leaves it friable to the fingers, so that it can be easily broken or cut to fit in anywhere. It is cemented together, after it is fitted into place, by a soft clay or any kind of softish mortar or cement. I think exceedingly well of it, especially as it is so easily applied.

An item that pervades the whole French section of machinery is the employment of herring-bone teeth and of angular teeth in gear wheels, and excellent pieces of workmanship they are too. Of course the herring-bone teeth are on cast gears, while all the angle teeth are on cut gears.

A similar practice, so far as herring-bone teeth are concerned, is coming into extensive use in the United States in the mines, I am told; but angular gearing (that is gearing on which the teeth are at an angle to the axis of the shaft) is less used in America than it was a few years ago. There is nothing to be said against it save its expense; but I certainly think that well cut ordinary gearing is quite as good. The English use a good deal of cast gearing, and their gearing is not, as a rule, as good as either the American or the French. I know that it was said by English critics at the Centennial exhibition at Philadelphia in 1876 that American machinists would use more cast gears when they understood more about casting them; but, as a matter of fact, American engineers know so much about cast gears that they decline to use them, and properly so, upon any but the roughest work, and especially upon machine tools. The claim that a cast tooth is stronger than a cut one will not hold water if properly looked into, because, although it is stronger if the thickness of the tooth alone is considered, yet the cut tooth is strongest in proportion to the pitch because it need not have play, and hence is thicker than the cast one for the same pitch, and is furthermore preferable as avoiding back lash. There is not a piece of gearing in this exhibition equal to that so often exhibited by the Pratt & Whitney Company, of Hartford, Conn., nor so good as I have seen at the Brown & Sharpe Manufacturing Company's works at Providence, R. I.

What is more trying to the quality of gearing than a planing machine table with a heavy piece of work on it, and what *can* run more quietly and smoothly than a Pond planer table? Finally, the Sellers planer table gearing here on exhibition is far beyond anything in its line in the whole Palais des Machines, and it is not going out of the way to assert that not one mechanic in ten who looks at it really understands its action, simple as it is. Indeed, I have been asked several times what was "the good of placing the shaft at an angle?" The French gearing is very nicely cut. Indeed, the more I see of French workmanship, the more I am impressed with it, and this, I must confess, is not at all what I expected. I noticed to-day a pair of friction bevel wheels (on a grinding mill) of vulcanized rubber, which, I should think, would involve a good deal of friction.

One more point about gearing, and I have done. I noticed some involute gearing of coarser pitch than it is usually made, and this brings up a question that has occupied some attention in the United States, and is likely to occupy a good deal more, to wit, the employment of involute instead of epicycloidal gears. The old English millwrights had and have an abiding faith in the epicycloidal tooth, and they created a corresponding abiding faith in the general engineering public, since gearing was so abstruse a subject that it was left to those who had a special knowledge of it. A French engineer expressed the opinion to me yesterday that the involute was the coming form, and I have heard more than one well known authority on the subject in the United States express the same opinion.

"Just consider for a moment," said the French engineer, "the fact that unless the pitch lines of epicycloidal gears coincide the curves become entirely wrong; and does anybody suppose that the pitch lines of cast gears coincide when new? And how long do the pitch lines of cut gears coincide if the duty is heavy or the speed great? Again, how can you cut the gears of coarse-pitched large wheels without an expense that is quite out of the question for all ordinary machines?"

Now this is quite true, but you can pitch and trim them. This is a process, however, far too costly for use in the United States. Just imagine, for example, pitching and trimming a 16 or 18 foot gear having say a 2 or 3 inch pitch. Now, as there are hundreds of American machinists who do not know what pitching and trimming is, let me explain that the wheel is put into the lathe, the points of the teeth trued up, and the pitch line of the teeth marked with a fine-pointed lathe tool. The curves are rolled, and from them the gauges are made for the teeth or the spaces, as may be elected, and the teeth are chipped and filed to correct shape. Just such a wheel met my eye on a French engine to-day, and a first rate job it was. The involute is an easier tooth to mould, inasmuch as there is but one curve to mend in case the sand gives way on the tooth, and pitching and trimming is less necessary, because it is not essential that the pitch lines should coincide. But as long as people call for epicycloidal teeth, it is useless to offer them anything else.

While upon the subject of items of transmission, it is in order to remark that the French employ ropes, and run each rope in a separate groove. I notice also that a similar construction has lately been put up in the United States. The question in my mind with regard to ropes is that it would seem difficult to keep the tension equal; but, on the other hand, the tension may regulate itself, the tighter ropes stretching the most. One thing is certain, and that is that ropes do not pocket the air as wide belts do, and so far as I yet see, rope (not wire rope) transmission is a success, and I shall watch it in the interest of your readers.

In the exhibit of Wm. Sellers & Co. their drill grinding machine is shown, and among its features are means for thinning the points of large drills by means of a small circular groove. Now this is an important matter, and as it is claimed here as an English invention that has been copied in the United States, it is as well to mention it in the interest of truth. The firm that exhibits this machine claim to make a better twist drill and to get more work out of twist drills than can be got out of American-made drills, and this same firm has copied, to a certain extent, the Sellers drill grinding machine. Their exhibit is one of those I have already mentioned as having extensively copied American designs, and I am of opinion that they are making some of the best machine tools in England.

Aut Felu Defize & Co., of Liege, Belgium, exhibit a shaping machine with a link quick return, this being the only one of its kind exhibited. It is a well built tool, and calls to mind the fact that the link as a means of converting circular into rectilinear motion finds much more favor in Europe than in America. Here, indeed, we find it applied to slotting machines, hand planing machines, shaping machines, and to hand pumps; and in view of the fact that it is simple and gives a fairly equable cutting stroke and a tolerably quick return, there is good reason for its selection for a great many purposes. There is, of course, the objection to it that when used on the shorter strokes the die does not travel the full length of the link slot, and the wear is not, therefore, equal; but if the wearing surface is ample and the material good, the wear is very little indeed. I have seen shaping machines in England with a link motion that have been in constant use every working day since 1848, and they are good machines yet.

The French have not exactly copied American designs in machine tools, but they have been quick to grasp American ideas in all such tools except the lathe, which they build on the general style of the English, whose smaller lathes are an abomination. In large lathes, as say those of five or six feet swing, there is much sameness in all lathes; but even here are advantages in American designs that I shall endeavor to point out in an article especially devoted to lathes.

JOSHUA ROSE.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The Paris Exhibition.

SPLENDID EXHIBITS OF THE FRENCH TECHNICAL COLLEGES—AN ARREST FOR MAKING SKETCHES FOR THE SCIENTIFIC AMERICAN—THE ENGINEERS' ASCENT OF THE EIFFEL TOWER

PARIS, June 25, 1889.

As I was taking notes on the exhibits of the French industrial schools to-day and making a simple sketch, as a sort of memorandum, the attendant of the exhibit of the Ecole Nationale d'Arts et Metiers, of Chalons sur Mer, who had been moving uneasily about for some little time, fetched a sergeant d'armes and arrested me, first conducting me to a sort of sub-prefecture near the Palais des Machines, and finally to the Commissionaire de Police, who told him that he ought to consider it a great honor and advantage to have the exhibit written upon in the SCIENTIFIC AMERICAN, and that it was for the express purpose of encouraging the press to describe the exhibits that the representatives of the press are given season tickets.

"But," said the crestfallen attendant, "he was in my department all day yesterday and this morning again at half-past eight, examining every machine, and I believe he moved some of the handles to try the workmanship of the machines, and more than that, he made sketches of important parts, and I thought he wanted to build copies of the machines."

I explained that it was my intention to write very fully on the machinery exhibits, that my sketches were somewhat numerous, and pulling out my notebook I turned over page after page of rough sketches, to the astonishment and dismay of the sergeant d'armes, who thought they were all from exhibits in the department he patrolled, and evidently expected that this would put a new face on the whole matter, and that he would be reprimanded for not stopping me before. The commissionaire, however, nodded approvingly, and seeing at once that the sketches were of interesting details and appropriate for a scientific journal, he told them that they had "exceeded their duties, and they must use more and better discrimination in the future, and not throw obstacles in the way of important scientific journals like the SCIENTIFIC AMERICAN, which was laboring for the good of mankind." This ended the affair, and while the sergeant was making the excuses that as the attendant laid an "information" against me, he (the sergeant) was compelled to arrest me, the attendant slunk away, and afterward kept away from me during the whole time I was in his department.

The employes seem to consider making a sketch as little short of a crime, no matter whether it is of their own exhibits or of any other exhibits. In one case a girl who was selling trinkets at a stand near the Belgian locomotives, and who spoke English, came to me and asked would I please not to make any sketches, as the young man in charge might get in trouble about it. This same "young man," however, had given me permission to sketch the day before, but when he saw the number of sketches he became alarmed and told me so; but my explanations did not ease his mind, and so a policeman was brought on the scene. Determined to see the matter out, I showed him my press ticket, offered him my address, and went on sketching. The official stamp on the press ticket satisfied him (or perhaps cowed him), as it had several other officers, and he declined to interfere. I told the attendant to take my address and report me as insisting on taking sketches.

"Nobody but you makes sketches," said he. "They ask me the weight of the engine, the amount of heating surface, what fuel we burn, and all these things, and go away satisfied. Why won't that satisfy you? What do you want to come here for hour after hour to annoy me with your sketching and get me into trouble?"

A laughable incident occurred the other day that is worth recounting. I was just beginning to make a sketch of an odd piece of designing when the machinist putting the engine together caught sight of my pencil and notebook, and the celerity with which he got up and came over to me put me on my guard, so that I just prevented him from snatching my book out of my hands. "It is strictly forbidden (*C'est absolument defendu*) to make sketches," said he, "and I won't have it." Putting my sketch book away, I bared my cuff and made a pretense to sketch on it. He was completely nonplussed, and began to look about for an officer. Then I turned to him and asked: "Is it also absolutely prohibited to carry away the design in your head?" Then I turned my back to the engine, took out my note book, tore out the embryo sketch, and handed it to him. He tore it into shreds with great satisfaction, while I, with my back still to the engine, made a side elevation and a plan of the connecting rod end (for that was all it was) and showed it to him. He looked at it, called his assistant to see it, shrugged his shoulders, spread out his hands, and said, "*Mais qu'est ce que on peut faire avec un voleur comme ca*" (but what can be done with such a thief?)

The most laughable part of the whole business is that these men, or many of them, seem to think that Americans want to copy their designs, whereas in a great many cases the things sketched are absurdities from an American point of view.

The impression received from a general survey of the exhibits of the French technical schools is twofold. First, surprise at the magnitude of the exhibits and the general excellence of the workmanship and apparent thoroughness of the courses of tuition; and next, disappointment at the backwardness in the way of designs. American boys do not know how fortunate they are in having instructors that are progressive men, always abreast, at least, of the times, and in this connection let me say that the arrival here of Professor Thurston, of Cornell University, was hailed with a great deal of pleasure and satisfaction by engineers of all classes, and I hear he is very hard at work, which accounts probably for our not seeing anything of him among the pleasure seekers.

It may be depended upon that technical education will play a part of greatly increasing importance every year, especially since it is becoming to be recognized in Europe that America has to be reckoned with in the fight for mechanical supremacy. I can myself remember the time when anything that was American was necessarily bad in European opinion, whereas at the present time everything that is American is now presumably superior in the estimation of the general public, especially with regard to light machinery.

The exhibits of the French technical schools consist of complete sets of general drawings of machines: Models of machines; examples of the exercises in turning, fitting, etc., of complete machines ready for use in the shop; of tools, such as stocks and dies, taps, etc., of patterns, and in some cases of castings made from the patterns, a notable instance being that of patterns for the frame and work table of a milling machine, which would be a creditable piece of work for a journeyman patternmaker, for the surfaces were clean cut and not sandpapered into smoothness, the corners were not wavy, nor were the round corners made shapable by

wax or putty, as is often the case in patterns made by indifferent workmen.

It is difficult in some cases to realize that the work before you is that of boys, and not practiced workmen, and one is strongly reminded of the Cornell University exhibit at the Centennial exhibition of 1876, where Professor Sweet's boys showed what could be done at a technical school, and opened the eyes of a good many practical mechanics.

In the exhibit of the *Ecole Manuelle d'Apprentissage* of the *Ville de Rouen* is a drilling machine by boys that is a creditable piece of work, both in fit and finish, its gears being cast and not cut. It has, however, a ratchet feed and no quick return. The work table is double, either half swinging into position beneath the spindle, as may be required. One part of the table contains a vise and a clamp chuck for holding the work, while the other part has a plane surface. In the same exhibit is a planing machine having a hollow spindle and bevel gear quick-return motion of the old pattern, that would be almost, if not quite, a curiosity in the shop of an American tool builder. This machine was made by eleven boys, of whom four of fifteen years of age made the patterns, one of fifteen and one of sixteen made the forgings, while three of fifteen and two of sixteen did the fitting and erecting. Not being allowed (in the absence of anybody authorized to give permission) to touch the machine, I cannot speak with absolute certainty of the fit of the parts, but to all appearance the work was well done; better, indeed, than on a good many machines I have seen that were made by men. The flat surfaces *were flat*, the joints close and even, and there was a thoroughly workmanlike look about the machine that was only spoiled by the design.

The railings inclosing this exhibit were very good specimens of artistic forgings, as were also some specimens of scroll work exhibited on the walls. Many of your readers will remember the exhibit of the Russian technical school at the Centennial exhibition of 1876 at Philadelphia, and the favorable opinions generally formed of them; but the exhibits here far exceed them in quantity and excel them in quality. The great and growing importance of technical education is getting to be well understood in Europe. England, which appears to have been so far behind in the race, is awakening, and the projects now in hand call for and will undoubtedly receive large donations by private and grants by public bodies. France, it is at once seen by the technical exhibits at the exhibition, is well advanced, and in a future letter I will go somewhat into the details of the exhibits.

A few words concerning the visit here of the American engineering societies may not be out of place. It was not to be expected that the fraternization of the hosts and visitors could be as thorough and as hearty as in London, on account of the difference in language. The French have received us well and tried all in their power to be kind and entertaining; but it must be candidly admitted that the visit here has not come off with the *eclat* of the London one. The ascent of the Eiffel tower was the principal event, of course, and here an incident occurred which calls for comment. The lower elevator, which takes passengers up to the first landing or platform, is conceded to have been the most difficult piece of engineering, on account of the curve of the arch; it also has the most work to do, as some visitors do not go up beyond the first platform. Furthermore, the lift of the first platform is 184 feet, while that of the second lift is 152 feet.

The elevator for the first platform is American (Otis), and it was packed full at every trip, some standing up. It ascended at a sharp pace, not so quick as some of the same make in New York it is true, but still at a good speed. The second elevator, however, was much slower, and was only allowed to take eighteen passengers on the up trip and fifteen on the down trip, the significant point being that it had seating capacity for several more. This was undoubtedly done to make its speed more nearly equal to that of the Otis elevator, but there was marked difference nevertheless.

It was also noticed that no grace was said either before or after the luncheon in the Eiffel tower, whereas grace was never omitted at any of the English repasts. In making out the programme for the proceedings of the joint visiting engineers, it was put to the vote as to whether anything should be allotted for Sunday, and unanimously voted to preserve it as a day of rest. Sunday, be it observed, is the busiest day at the exhibition, but the American section is virtually closed on that day, no attendants being present and many of the exhibits being covered up. If this is done more on Saturday night than on any other, it may be regarded as a sort of protest against French customs, and, therefore, not altogether in good taste.

Nothing definite is yet known as to whether the American engineers will accept the invitations received from Germany; but it is doubtful if their organization as a body will remain sufficiently intact to enable them to keep together sufficient members to render acceptance permissible. JOSHUA ROSE.

THE late Melbourne exposition resulted in a deficit of $1,250,000.

How to Succeed.

A valued correspondent, a man of business of wide and varied experience, sends us the following pointed paragraphs for publication. When taken in a contrary sense, they contain some very sound advice, though couched in language that may be thought—by the over-sensitive—to be rather sarcastic. Men of good common sense, however, who are anxious to advance, and who are not already "loaded to the guards" with knowledge, may obtain ideas from them that will be beneficial.

The way to become successful business men from every standpoint of the word, both as to position and money making, is not to observe the following suggestions, but to act in a directly opposite manner:

If office hours are set from eight to twelve and from one to six, don't fail to make it a point to arrive at the office anywhere from fifteen minutes to an hour late.

Watch the clock carefully, and try to get out five to ten minutes before twelve, and then come back from ten to thirty minutes past one, or up to two p. m.

In the afternoon watch the clock anxiously, and if you see a chance to "escape" without the eyes of the management upon you, always make it a rule to get out at five o'clock, or just as much ahead of this as possible.

If you should not happen to be employed as a salesman, don't think of such a thing as asking a visitor in a polite manner if anything can be done to serve him. He might think you were a salesman, and this might degrade you in his estimation.

When a visitor comes in the store, never walk forward to greet him. Always let him walk from the front door to the inside of the office, and let him state his business. This course makes him feel very much at home.

After he has stated his business, don't attend to him until his wants are thoroughly satisfied and he goes away pleased, but if he is in want of something else, turn him over to some subordinate.

They have little or nothing else to do, and know the business so much better than any one else, that they are likely to be pleased with the treatment they receive from the subordinate better than they would by attention from you.

If you are a salesman, don't fail to see how soon you can rid yourself of a visitor. Never think of showing him anything beyond what he asks to be shown, as it might possibly interest him and effect a sale of other goods.

Don't act upon the principle that heavy rents and salaries are being paid for the very purpose of inducing people to come into the store, in the hope that they will be shown everything, both in the way of goods and advertising, that could possibly interest them. Always think that heavy rates and salaries are simply paid because the company has lots of money and are doing business for glory.

Always act as if you were doing something of a condescending nature when you give your time to a visitor. Don't let him get the idea in his head that you feel it as condescension upon his part to visit you.

Take it for granted that all other houses in your line of business are doing business upon the same principles which you are, and that they are anxious to save their valuable time and hustle a man out of the store as soon as they can, whether it is decently or politely done or not.

Don't make it appear to your principals, or to the customer, that you are bending every energy in the direction of selling goods, but rather stand upon the high and lofty principle of being something better than the average customer.

If you are a bookkeeper, never speak to a man in a polite and affable way when he comes to collect a bill, but if the bill is right, sling the money or check toward him as you would a piece of meat to a hungry dog, and make him believe you are doing him a great favor to pay him what is justly his due.

If there is any discrepancy in his account, always make it appear that you are the only man in the world who could have discovered it, and give him the idea that he has been trying to rob you. This will make him feel pleasant toward the house as well as toward you.

Don't take it for granted that a man likes to see a carefully made bill, but in making out bills abbreviate everything you can, and make it as intricate and hard to understand as possible.

When a mistake occurs in an account or order, don't undertake to explain the matter away in a pleasant, affable manner upon the presumption that the man who makes the complaint thinks he is right, but go at him "hammer and tongs" in the shortest and curtest way possible, and try to impress him with the idea that he is always wrong and that you are always right. This will give him an idea that he is dealing with a pleasant lot of people, and will encourage him to bring his business to you the next time.

If you see anything going wrong in any department of the business, don't think for a moment that the management would be glad to know of it and have it rectified; and if you should happen to see samples in a disorderly condition, never speak of it or attempt to put them in place yourself, as you might soil your hands.

Don't attempt to do anything toward keeping the office in a clean and orderly condition. A little confusion, disorder, and carelessness upon the part of all make an office beautiful and attractive, and, of course, what little disorder you exhibit personally does not make any difference, and if you were to straighten out something that some one else did, you would be doing more than you ought to, and it would overwork you.

When you are on the road, make it a point to get to some good hotel Friday or Saturday, and never leave it until Monday. Time is little or no consideration in a busy season, and it is always desirable to spend one or two days of the week in "bracing up," so that you will be fresh on Monday morning.

As versatility is one of the necessary requirements in a good salesman, expend your time in learning to play the latest hands at poker and other fashionable games, and be sure that you always keep your capacity for drinking liquor of all kinds up to the average, else your brother salesmen on the road would not recognize you as "one of the finest."

Don't imagine that your principals ever know anything about what you are doing when you are away from home, but act upon the idea of "out of sight, out of mind," and do everything without reference to what your employers would have you do or what you should do to make your part of the business a success.

Don't reason upon the principle that the more you do the more valuable you are to the house, and that when the time comes there will be a chance for promotion.

Men who have acted upon this principle are, of course, the ones who are in the best positions in the trade and making the most money.

Don't imagine that anything you do in the direction of showing a special, personal interest in every detail of the business will be appreciated by your principals, some of whom may be getting old or ready to retire from business.

Don't do anything as if you had a financial interest in the business, or as if the business was your own. Such action as this upon your part would show that you were not calculated to be promoted in case there was an opportunity for promotion.—*Stoves and Hardware.*

The Loss of Heat by Unprotected Steam Pipes.

Mr. Albert Haacke, of the Kieselguhr Company, has recently fitted up an apparatus for measuring the amount of heat lost by radiation and convection from steam pipes and the like, and has communicated the results of some of his first experiments with it to *Engineering*, together with a description of the arrangement. The tests in question were directed to determine the relative losses of heat from (1) bare pipes; (2) pipes covered with 1 inch of fossil meal composition; and (3) pipes covered with 1 inch of fossil meal composition and three layers of hair felt. The testing surfaces are represented in Mr. Haacke's arrangement by three cast iron steam pipes of 5 inches internal diameter and 6 feet long with blank flanges on each end. These test pipes are supplied with steam that has been dried, and are placed so as to be subject to radiation and convection under precisely similar conditions, one being bare, the other covered with fossil meal composition 1 inch thick, the third with 1 inch of composition and three layers of No. 3 felt, each ⅛ inch in thickness. The result of experiments with steam in the different pipes under pressures of from 45 to 60 lb. and upward goes to show that a covering of fossil meal composition 1 inch thick saves out of a possible loss of 100 per cent as much as 83·57 per cent; and if over this covering 1⅛ inches of hair felt with canvas is added, the extra saving is only 8·25 per cent. If 1 lb. of steam coal is required to evaporate 8 lb. of water into steam of 60 lb. pressure, then 6⅛ cwt. of steam coal are required every year to make good the loss of heat from every square foot of uncovered steam pipe. This loss is even greater in winter, or when the pipes are exposed to wind and rain, or where steam of high temperature is used. Finally, Mr. Haacke combats the opinion which is firmly established in the minds of many users of steam, that the outside temperature of a non-conducting composition applied to hot surfaces is a measure of its non-conducting efficiency. He considers this test of measuring the outside temperature, either by the hand or even by thermometer readings, as unreliable and misleading; and insists upon condensation experiments as the most reliable method of ascertaining the loss of heat by steam.

PROF. FRESENIUS, of Wiesbaden, after a long series of chemical analyses, declares that an egg contains as much nourishment as a pound and an ounce of cherries, a pound and a quarter of grapes, a pound and a half of russet apples, two pounds of gooseberries, and four pounds of pears, and that 114 pounds of grapes, 127 pounds of russet apples, 193 pounds of pears, and 337 pounds of plums are equal in nourishment to 100 pounds of potatoes.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM BOILER. — Robert S. Rodie, Jersey City, N. J. This invention especially covers the main boiler shell, made in two cylindrical or rounded sections, joined diagonally in elbow form, making the entire shell self-bracing around the sides, dispensing with stay bolts to brace the shells, while stay bolts are employed only to brace the rear end plate and the walls of the fire box and combustion chamber, there being other novel features of construction of the interior of the boiler.

BALANCED SLIDE VALVE.—Frank D. Patten, Montrose, Iowa. In this valve there is a flexible connection between the piston working in a cylinder at the top of the steam chest and the plate or rail carrying the anti-friction wheels or rollers on which the valve slides, the rollers rotating on fixed journals, while means are provided for preventing endwise vibration of the plate or rail carrying the rollers.

Railway Appliances.

CAR COUPLING. — Patrick J. Egan, Carleton, New Brunswick, Canada. The drawhead has a coupling pin working in a pin opening, with a block of elastic material rigidly secured in the drawhead in rear of and adjacent to the pin opening, and having a shoulder, which, when the block is in its normal position, is in alignment with the pin opening, the construction being simple, and the coupling being adapted to couple two drawheads of different heights.

RAILWAY SWITCH.—James B. Suffern, Hillburn, N. Y. Combined with the vertical shaft of the switch stand is a lever connected with the switch stand shaft and with a track lever, and arranged to spring the switch stand by the engagement of the wheels with the track lever, whereby the switch will be set to render the main track continuous by the action of the locomotive or car wheels.

Mechanical.

SPLIT PULLEY.—Edward F. Schneider, Racine, Wis. This pulley has a central part or hub formed in two sections, arms being supported face to face by such sections, while rim sections are secured at their ends to the ends of the arms, and plates are connected to the abutting ends of the rim sections and to the arms to join the two pulley sections, with other novel features, making a pulley which may be applied to the shaft without removing the shaft from its bearings.

PRESS FOR HAT BRIMS.—William G. Harsin, Newburg, N. Y. Combined with a suitably constructed and jacketed bed and hinged platen are heating medium circulating pipes connected at their forward ends with the heating belt or jacket of the platen, and arranged to turn in sockets in the rear in axial line with the hinge center of the platen, giving a superior finish to the inner surface of the brim of the hat, and doing the work more quickly than heretofore.

SAW GUMMER. — Jason W. Mixter, Plymouth, Mass. Combined with the gummer is an adjustable gauge bar or link and an adjustable lock link or bar capable of contact with the gauge link, for gauging the exact depth of circular saw teeth in process of gumming and insuring a uniform depth for all the teeth, the device being simple in construction and readily manipulated.

SAW SWAGE.—Jason W. Mixter, Plymouth, Mass. This swage has a triangular tongue with a die secured to its base at top and bottom, and has guides with a longitudinal recess upon the inner face capable of receiving the sides of the tongue, with means for securing the guides to the tongue, and other novel features, whereby the operator will be enabled to hold the swage perfectly true and even and bring the center of the crowning die in the center of the saw teeth.

MACHINE FOR FORMING SPIRAL GROOVES.—Ralph W. Jorres, Bristol, Conn. By this machine a cutting or graving tool is held and guided to form an ornamental spiral groove in the surface of a panel, the invention covering a revoluble shaft and tool carrier and connections whereby, as the shaft is revolved, the carrier is moved longitudinally over the upper end of the shaft.

FEEDER FOR POWER PRINTING PRESSES.—Levi Orser, Galveston, Texas. By this invention lifters are employed which hold the paper by a mechanism producing a partial vacuum, which is destroyed when the lifters have deposited the paper for the nippers, holders on a horizontal rod transferring one sheet at a time, the rod being raised and lowered and carried horizontally by levers.

FEEDER FOR TREADLE PRINTING PRESSES.—By the same inventor. By this invention a sheet of paper on the feed plate and a printed sheet on the platen are simultaneously lifted and carried respectively to the platen and holder plate, the lifters holding the paper by a mechanism producing a partial vacuum, combined with a mechanism for cutting off the suction and releasing the paper and moving the lifters in the proper time and direction, the platen having automatically opening and closing clamps, and the feed plate having an adjustable device to prevent more than one sheet being lifted at a time.

Agricultural.

PLOW.—William H. Bradshaw, Orange, N. J. This is a plow in which the mould board or cutter is designed to move in a zigzag or diagonal course, more or less, as desired, as the machine is advanced over the ground, cutting lateral furrows of any required length, from one foot or less to four feet and more, the mould board having no landside, so that it will easily enter the ground and keep its course.

CULTIVATOR AND SEEDER.—Louis S. Fistan, Pittsburg, Texas. This invention covers various novel details and combinations of parts in a machine adapted to break land broadcast with turning shovels or turning plows, preparing the land, bedding it, and planting it at the same time, while the seeder and planter can be readily detached, and the crop cultivated with any kind of plow desired, it being readily converted into two single stock or standard cultivators.

BALING PRESS.—By the same inventor. This is a press for baling hay and other material, in which the tongue of the machine may be used as a sweep to move the follower to one or the other ends of the press box, and to force the bale out after it is pressed, the press box having two baling chambers, one of which may be filled while another bale is being pressed, the box being usually supported on wheels or runners for convenience in taking from field to field.

Miscellaneous.

HIP BELT. — William H. Bevinger, Middletown, Ohio. This is a belt of simple construction, adapted for attachment to a pair of trousers, but not passing entirely around the body, and suitable for use as a substitute for the ordinary suspenders, whereby the trousers may be firmly supported without materially binding or pressing the stomach.

WASHING MACHINE.—Robert P. Starbuck, Harrisville, West Va. This machine has a suds box with a cylinder compartment and an open compartment, an upright with hook being arranged at the end of the suds box opposite the open compartment, with other novel features, whereby the clothes may be boiled, washed, and rinsed, in the same body or box.

WATER CLOSET. — Howland Weston, East Saginaw, Mich. The design of this invention is to provide a closet which may be left unattended for any length of time and remain filled with water, and which provides means for automatically discharging water from the flushing tank into the bowl, should the latter become empty through evaporation or otherwise.

SAFETY APPLIANCE FOR BOTTLES.—Leon L. Meynieu, Bordeaux, France. This appliance consists of a safety band of tin foil, secured to a capsule of the same material, and under a gummed label on the bottle, so that when the capsule is taken off the safety band is torn and cannot be used again in any case.

GAS LEAK DETECTOR.—John F. Stark, New Haven, Penn. This invention consists of a device in which phosphorus is used in connection with wire gauze within a glass or transparent tube open below, but having a cover on its top, and provided above or on its top with a wire gauze covered opening, the instrument being one which can also be used in the dark, and designed to instantly show even the smallest leakage of gas in a room, when the phosphorus is exposed.

BAGGING APPARATUS.—Thomas B. Jones, Radnor, Ohio. This is a combined truck and bag holder, the bag holder being connected between its ends to the front end of the truck body to rock vertically, and with a forwardly projecting body at its lower end to support the bag and devices to engage its mouth, being especially adapted for use in a field for conveniently sacking corn, potatoes, and similar articles.

DETACHER FOR CHECKS, ETC.—Alfred H. Cridge, New York City. This is an implement for facilitating the detection of forgeries by providing for the detaching of checks, tickets, certificates, and other papers ordinarily torn from stubs, the tearer having an irregularly serrated edge, the line of tear produced by the implement varying with each particular use, so that the ticket or other paper separated from the stub can be fitted only to its own particular stub.

CARD HOLDER. — John Clayton and Jacob Abraham, New York City. This invention consists of a vertically adjustable rod, provided with a holder of special construction for supporting cards, the device being specially designed to display cards having an inscription relating to prices, quality, or other details, over articles in stores.

ASH SIFTER.—Joseph W. Love, Baltimore, Md. This invention covers an improvement in sifters in which two screens are arranged at an angle to each other, so that mixed cinders and ashes pass from the upper screen on to and over the lower one and are delivered into different receptacles, there being an angular hood between the screens which supports the upper one and forms the cover and sides of the lower one.

STOVE.—Nicholas J. Engler, Ipswich, Dakota Ter. The shell of this stove has a cone-shaped bottom from which a smoke pipe leads, while perforated pipes held in the shell connect with the chimney pipe, preventing the smoking and puffing out of fire into the room, the stove being simple and durable in construction and very effective in operation.

SINK BACK.—Thomas F. Coyne, Brooklyn, N. Y. This sink back has a recess in its rear for the reception of a supply pipe, on which a nipple is formed, there being an apertured offset or rosette connecting with the recess and forming a passage for the nipple, the construction being simple and durable, and obviating the necessity of cutting recesses in the wall or wainscoting for the supply pipes.

EAVES GUTTER FOR ROOFS. — John Phelps, Dulwich, Surrey County, England. This gutter is made of sheet metal bent to the proper form, and has a sloping cover overlapping the roof and secured thereon, but at sufficient distance above the roof to permit drainage, the object being to prevent the choking of the gutter by the accumulation of snow, leaves, or other rubbish, and to render the gutter tighter and stronger.

SASH HOLDER. — Elias C. Pruitt, Twiggs, S. C. This fastener consists of a stem and a double cam-faced plate made integral therewith, the device to be secured to one side of the window casing, and affording ready means for locking the sash in any desired position, while normally the sash will be held closed.

HINGE.—Sidney L. Stiles, Watseka, Ill. This invention consists in the peculiar construction of the pintle or hinge pin, combined with a friction roller and its journal, whereby the latter is more strongly braced as the friction roller rises over the cam, being an improvement in that class of hinges in which one leaf in being opened rises over an incline on the other, so that the weight of the shutter, door, or gate will tend to automatically close it.

WHIFFLETREE. — Louis S. Flatau, Pittsburg, Texas. This whiffletree consists of a single metal plate having perforations and bent to form a hollow tree, the hooks and ring having enlarged perforated ends, the end hooks acting as automatic safety hooks to render it impossible for the traces to become accidentally unhooked.

RUNNING GEAR.—Uriah E. Miller, Heilig's Mills, N. C. This invention relates to wagons in which the reaches are longitudinally adjustable, and so made as to effect the turning of the wagon in a small compass, the construction being such that the hinge or pivot of the reach may always be central of the front and rear axles, while the pivoted reach may be removed and a rigid one alone used.

CLASP. — Jacob H. Bley, New York City. This is a clasp for use on suspenders, neckties, etc., and consists of two arms loosely connected with each other, with a slide fitting over the arms and serving to open and close them, and to lock them in place.

BELT CLASP.—George E. Zeltmacher, Brooklyn, N. Y. The body portion of the clasp has a longitudinal groove in its under face at each side and a hook integral with one side edge, while a toothed lock lever is pivoted upon the under face beneath one of the grooves, and a keeper bar consisting of a metal strap has its under face indented to receive the hook of the body.

OPERA GLASS HOLDER.—Gideon Isley, Jersey City, N. J. This invention relates to the lower section or handle of the holder, which has an outer ornamental tube of hard rubber, celluloid, metal, leather, or other suitable material, in combination with intermediate continuous tubes and a sliding section having a stud, the holder being adapted to be closed in small compass.

NEW BOOKS AND PUBLICATIONS.

THE PSYCHIC LIFE OF MICRO-ORGANISMS. A study in experimental psychology. By Alfred Binet. Translated from the French by Thomas McCormack. Chicago: The Open Court Publishing Company. 1889. Pp. xii, 120. Price 75 cents.

This study of comparative psychology will be read with interest by biologists, and illustrates very well the advanced line of study being pursued by devotees to that branch of science.

CHALLEN'S ENGINEER'S LOG BOOK OF DAILY RUNS. New York: Howard Challen. 1889. Price $1.

This admirable little work, which consists simply of a series of pages ruled for all the different data important to those running steam engines, should be in use by every steam plant engineer. Where such a work is kept, all the conditions for economic running are much more liable to be carried out than where the old fashioned "rule of thumb" is followed.

HAND BOOK OF MODERN STEAM FIRE ENGINES, INCLUDING THE RUNNING, CARE, AND MANAGEMENT OF STEAM FIRE ENGINES AND FIRE PUMPS. By Stephen Roper, engineer. Second edition, with illustrations. Philadelphia: Edward Meeks. 1889. Pp. 413. Price $3 50.

This book is devoted to the mechanism and practical features to be observed in the management of the modern fire department plant. A number of illustrations of engines and parts of the same are given, and the whole work is one eminently worthy of study by fire department engineers or those interested in the subject of preservation from the danger of fire.

ELECTRICAL RULES, TABLES, TESTS, AND FORMULÆ. By Andrew Jamieson, C.E., F.R.S.E. Fully illustrated. New York: The Industrial Publication Company. 1889. Pp. 64. Price 75 cents.

This useful little book gives a number of tables of electrical data and rules for their application. It is small, so as to be easily carried, and is very convenient and well arranged. It is illustrated with engravings of apparatus, etc.

A REPORT ON THE TERMINAL FACILITIES FOR HANDLING FREIGHT OF THE RAILROADS ENTERING THE PORT OF NEW YORK. By Gratz Mordecai. New York: *Railroad Gazette*. 1885. Pp. 68.

A full review of the facilities of New York as a terminus and railroad center is given in this report, and will be of interest to warehousemen and all interested in the progress of the city.

A HISTORY OF THE PLANING MILL. By C. R. Tompkins, M.E. New York: John Wiley & Sons. 1889. Pp. ix, 222. Price $1.50.

The history of the planing machine and also the practical points in connection with the management, setting up, and running of the same are here treated. It forms an interesting work for all wood manufacturers, and its eminently practical character will be found to make it exceedingly good reading for mechanics.

HARTFORD, CONN. Illustrated. Published by the Hartford Board of Trade. 1889. Pp. 220.

The Board of Trade of the capital city of Connecticut are responsible for a publication giving a full description of the city and illustrations of its various public buildings and manufactories, the object being to disseminate knowledge concerning Hartford, in order to increase the establishment therein of extensive businesses and factories. Coming from a body of authority, the work is an acceptable presentation of the good features of the city.

THE CHRONICLE FIRE TABLES FOR 1889. New York: The Chronicle Company, Limited. 1889. Pp. 264.

This book contains an exhaustive statement of the losses by fire in the United States under the headings of States and causes. Thus, under each cause is given the State name and number of fires thereby occasioned, and besides this, in another portion of the work, under the names of the States, is given a classification of the houses burned. This, with the other tables not necessary to describe here, makes the book a very complete manual of reference and one very readily and quickly referred to.

TRAITÉ DE TELEGRAPHIE SOUS-MARINE. Par E. Wunschendorff. 469 gravures dans le texte. Paris: Librairie Polytechnique, Baudry et Cie. editeurs. 1888. Pp. x, 555.

This work is devoted to the subject of submarine telegraphy in all its aspects, beginning with the history of the subject. The practical part treats of the different features, conductors, insulating envelope, exterior armor, instruments, soldering, machinery for laying cables, apparatus for transmission, and all the varied details appertaining thereto. It forms a very complete and elegant work, and one which should be in the library of every one interested in the titular subject.

THE MANUAL OF AMERICAN WATER WORKS, COMPILED FROM SPECIAL RETURNS. M. N. Baker, Ph.B., editor. 1888. Published by *Engineering News*. New York. 1889. Pp. lxxxvii, 611.

Under the heading of the different States are here given a very complete statement of the dams and water works of the country. It is of especial interest now in connection with the recent Johnstown disaster, although the reservoir which burst, having been devoted entirely to fishing purposes, is not included.

MECHANICS OF ENGINEERING. Fluids. A treatise on hydraulics and pneumatics. For use in technical schools. By Irving P. Church, C.E. New York: John Wiley & Sons. 1889. Pp. vii, 515 to 892. Index ix to xii.

In this volume is bound by itself the fourth part of "The Mechanics of Engineering," including all the matter devoted to hydraulics and hydrostatics, the flow of water, flotation, pressure in pipes, and all the many theoretical and practical problems which arise in connection with this subject. It is well treated, a number of formulas being given, with little or no use of the calculus.

THE CENTURY DICTIONARY: AN ENCYCLOPEDIC LEXICON OF THE ENGLISH LANGUAGE. Prepared under the superintendence of William Dwight Whitney, Ph.D., LL.D., Professor of Comparative Philology and Sanskrit in Yale University. In twenty-four parts. Part 1. Published by the Century Company. New York. Pp. xvi, 272. Price $3.50.

We have received the first installment of the Century Dictionary, carrying it up to 272 pages and to the word "appetence." The ground covered by this wonderful work is far greater than ever before attempted in any completed dictionary; the length of the definitions, and, in many cases, descriptions, under each word, give it the character of an encyclopedia. The extremely numerous illustrations and figures in the text, and the elegance of the paper and attractive form of the type, make the book impress one almost as a work to be read consecutively. The full work, judging by this portion, will be a monument to American enterprise and scholarship, and one that the United States cannot be too proud of. Any review of it that is at all just must simply run into eulogy, and can be nothing less, as the work seems to be well nigh above criticism.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1021) J. M. M. asks: 1. Will you kindly state in your answers to queries whether from photographs about 4 by 5 in. in size, stereopticon plates could be made, and about what the cost of such plates would be? What is the method of developing the above? A. To make magic lantern slides from 4 by 5 photographs requires first a suitable camera and lens to make from the photos a negative 3¼ by 4¼ in. size. This can be done on dry plates costing 45 cents per dozen. After the negatives are made, the lantern slides are produced by exposing special lantern slide dry plates, such as the Eastman or Carbutt's transparency, 3¼ by 4 inches in size, behind the negative in a printing frame, eighteen inches distant from a gas or kerosene light, from 8 to 18 seconds, according to the density of the negative. The plate is removed from the frame and afterward developed in a solution of hydroquinone 10 grains, sulphite soda 40 grains, carbonate of potash 20 grains, water 1 ounce. When image is well brought out, development is stopped, the plate washed off, then immersed in a solution of hyposulphite soda 1 ounce, water 6 ounces, which fixes the image. After washing for half an hour, plate is dried and is ready to be mounted for the lantern. 2. How can I make a stereopticon which will use any picture, as a photograph or card? A. Arrange lamp and condensers to throw a beam of parallel or slightly converging rays upon the picture placed at angles of 45° with the axis of the beam. Place the objective at right angles to the same axis, so as to receive the light reflected by the view. All must be inclosed in a light-proof casing, and the room must be very dark. 3. Is there a solution of copper oxide used in the determination of minerals, and how is it prepared from the powdered black oxide? A. No such solution is used to any extent. Oxide of copper dissolves in many acids and in ammonia.

(1022) J. W. asks: Can you suggest, in your "Notes and Queries" column, a remedy for pen paralysis or writer's cramp? Have tried the electric current; bathing with salt water; frequent change of and different kinds of penholders; holding the pen between the fingers, etc., but all, apparently, to no purpose. A. An India rubber tube slipped over the penholder is of some benefit. If you have patience enough, one way to effect a remedy is to learn to write with the left hand. The malady does not yield with certainty to any treatment.

(1023) J. C. asks: I want a formula for making a good smooth flour paste that will not ferment, spoil, or turn sour in hot weather. Suitable for paper hanger, bookbinder, trunk manufacturer, etc. Am now making many barrels per day, but wish to improve my paste as mentioned. A. Use good rye flour, drop it with constant stirring into boiling water until proper thickness is obtained, boil for five minutes, stirring, and continue to stir after removing from fire until the boiling ceases. If enough pure carbolic acid is added to give it a slight odor, or if one or two ounces of salicylic acid are added to a barrel, it will act as a preservative and prevent souring. Or to 100 parts of the flour paste made as above add three parts strong alum water and five parts dextrine solution. Oil of cloves or water that has been boiled over cloves may be added in quantity enough to give a slight odor instead of carbolic acid.

(1024) H. T. B. asks whether any electric light can be produced by a battery. I mean a small light, a simple battery? If so, please state what kind of battery can be used? I have a crow foot battery. A. A good bichromate battery of three or four elements will supply a small incandescent lamp, giving one or two candles illumination. The crow foot battery is not adapted for lighting.

(1025) J. W. D. asks how to bleach bone. A. Wash with turpentine or naphtha or weak alkali; wash next with clean water, and sponge off with solution of binoxide of hydrogen.

(1026) W. T. asks: 1. For the pressure at different temperatures with sulphuric ether vapor. A. The following pressures are stated in millimeters of mercury: For 10° C. = 288·4; 20° C. = 433·2; 30° C. = 636·3; 40° C. = 909·6; 60° C. = 1728·5; 90° C. = 3398·0; 100° C. = 4960; 120° C. = 7702·2. The pressure runs up very rapidly, and at 150° C. or 175° C. would be very high. By interpolation, we obtain from the above the following approximations: For 50° C. = 1264; 70° = 1948; 150° C. = 13,606; 175° C. = 21,616. By dividing the millimeters pressure by 760, you will have the result in atmospheres. 2. How many cubic feet of hydrogen and oxygen can be produced per hour from the decomposition of water with a two h. p. engine and a dynamo? A. It depends on the resistance of the decomposition apparatus. You would obtain about 150,000 c. c. oxygen = 9,150 cubic inches, 300,000 c. c. hydrogen = 18,300 cubic inches.

(1027) F. W. J. asks: 1. Why is it that the carbon points in an electric arc lamp are coppered? A. The carbons are coppered to increase their conductivity. 2. In recharging a Bunsen battery, does the carbon element need replacing as often as the zinc element? A. The carbon elements of a Bunsen battery will last indefinitely, provided the carbon is of good quality. 3. Does the larger carbon point in an electric lamp give the more resistance to the electric motive power? A. Large carbons offer less resistance than small ones, but there is a certain proportion between the size of the carbon and the amount of light given.

(1028) G. J. H., Jr.—The following is a platinum toning solution:

Chloride of platinum	1 gr.
Nitric acid	1 min.
Water	4 oz.

To print on silk prepare following solution:

Boiling water	20 oz.
Chloride of ammonium	100 grs.
Iceland moss	60 grs.

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20 grains to ounce silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in—

Water	20 oz.
Acetate of soda	2 drms.
Chloride of gold	3 grs.

Common whiting, a few grains. Fix in hypo 1 to 20.

(1029) F. G. asks how he can rid his cabbages of the green worm, also what will destroy hop vine insects, and lice upon chickens. A. Professor Howard, acting entomologist, to whom we submitted the matter, says he can best treat his cabbages with a dilute kerosene emulsion made according to the following formula:

Kerosene	2 gals.	= 67 per cent.
Common soap or whale oil soap	½ lb.	= 33 per cent.
Water	1 gal.	

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray noxzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens upon cooling and should adhere without oiliness to the surface of glass. Dilute, before using, one part of the emulsion with nine parts of cold water. The above formula gives 3 gallons of emulsion, and makes when diluted 30 gallons of wash. The same substance will be of great use upon his hop vines and will also kill the lice on chickens. It will be well to spray it about pretty thoroughly in the hennery.

(1030) C. F. B. asks: 1. How can printing be removed from the back of postal cards without injuring the cards? A. No practical method of doing this is known. 2. Is there any paper printed in German or English language entirely devoted to entomology? If so, which is the best? A. Write to the Department of Agriculture, Bureau of Entomology, Washington, D. C., for Bulletin No. 19, entitled an "Enumeration of the Published Synopses, Catalogues, and Lists of North American Insects." Also under same address apply for *Insect Life*, a periodical devoted to the science in question, published by the same department and bureau.

(1031) E. M. asks (1) for a good disinfectant to put into a spittoon, in the bed room of a person who has a lung complaint and expectorates a great deal. A. Use sulphate of zinc 1 part dissolved in 10 parts of water. Remember that it is a poison. 2. We have just moved into a new house, a few yards back of which is a large grove of pines and chestnuts, and are troubled a great deal by small red ants. How can we get rid of them? A. Half fill bottles with sweetened water and leave them in inclined positions in the corners of rooms infested. These, it is said, will catch them. Or distribute camphor in places infested, as they have a great aversion to it.

(1032) F. H. asks how to make an ink that will give a copy after it has stood a month or six weeks, without the use of a press, but with the weight of a large book. A. You can make any ink copy by adding a little glycerine or sugar to it. A large book can give but little pressure. A common rolling pin on which you bear heavily can be used with much better effect. Even tightly rolling the matter around such a cylinder by hand will give a good result, as a substitute for a press. To make such an ink, use aniline black dissolved in water and add about one-tenth of its volume of glycerine.

(1033) W. H. G. asks (1) if an ordinary boy can learn telegraphy at home and without a teacher. A. You can get a very good idea of it, but must have office practice. 2. If so, what instruments, etc., would you advise him to get? A. Procure a learner's set from any of the dealers in electrical supplies, and also a manual of telegraphy. 3. If not, what would it cost to learn at a school? A. Address any business college for terms. Often the station operators will teach for a small consideration. They give the most practical kind of instruction.

(1034) W. T. P. asks if the harbor of New York is sufficiently defended to withstand the attack of any navy of the world for twenty-four hours, and if the fortifications are modern. A. The fortifications of New York harbor are not of modern type, and the harbor cannot be said to be prepared for immediate defense. A few weeks would do a great deal to prepare it, the harbor vessels and coasters being pressed into service, and batteries being thrown up at Sandy Hook and along the Narrows.

(1035) A. G. asks (1) for the best way to clean and bleach the rattan of a baby carriage. A. It can be cleaned with benzine and afterward well aired. Bleaching may be done with dilute solution of sulphurous acid, but this attacks all the metal fastenings and is objectionable. Binoxide of hydrogen and ammonia may be used. A good plan is to varnish with a white hard-drying varnish. 2. Is it practicable to make a clock spring run a palmetto fan and keep a person cool? If so, what size spring would be necessary to drive a hub containing two fans say four hours? A. Hardly. The springs would have to be very large, and the winding would take some time.

(1036) G. R. asks: Is there any preparation for tempering steel so that it will resist ice, but still be soft enough to be filed? A. Harden the steel and draw it to a purple color.

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July 2, 1889,

AND EACH BEARING THAT DATE.

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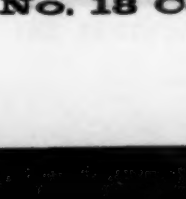

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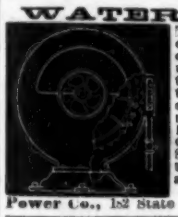

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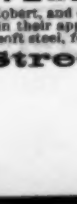

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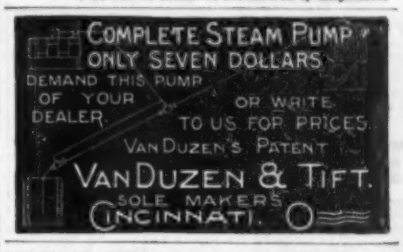

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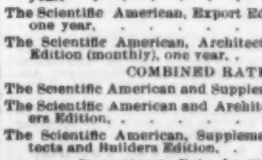

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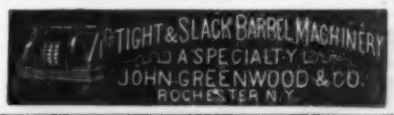

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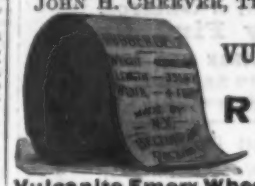

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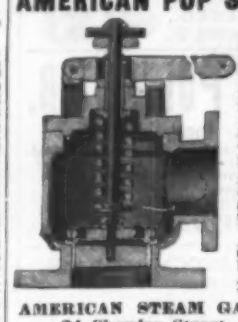

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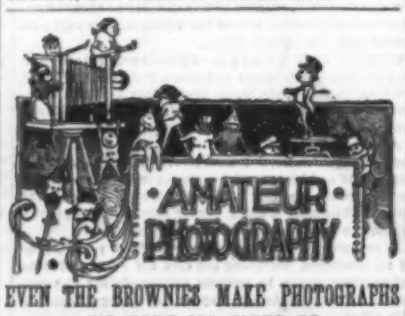

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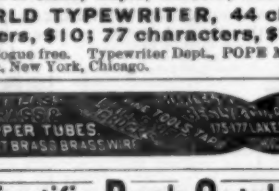

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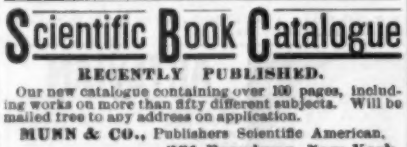

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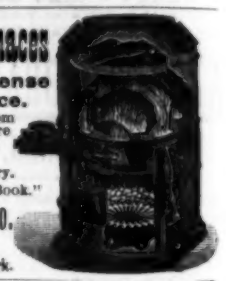

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